Trees in Patagonia

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Bernardo Gut

Trees in Patagonia

Special collaboration Ing. Ftal. María Paula Guzzetti

Contributions by A. Díaz, P. Lépez, M. Rumboll, and G. Vittone

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Cover illustration: Front cover, left: north-exposed slope of PN Lago Puelo (see p. 19); right: shape of Fitzroya cupressoides (see p. 71). Back cover, from left to right: Islet in the Río Menéndez (see p. 59); Lago Verde, PN Los Alerces (see p. 231); Lago Rivadavia.
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In memory of Patagonia's
scientific discoverers.

Contents

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de Lorenzo Cáceres (2001); More (2003); Parodi (1959); Rodríguez et al. (1983); Tutin et al. (1964-1980) and (1993); White et al. (2005) – Concerning the information about hardiness, I have quoted the lowest temperature according to More (2003). Data on the phenology were taken from Rodríguez et al. (1983) or estimated on grounds of the tables given by Gaida and Grothe (2003) and may be applied to the region of Bariloche-Esquel and Puerto Montt.

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1. Introduction

Fig.1.0: Lago Frías and Monte Tronador (3478 m) (09.03.2004, late afternoon)

The idea underlying the present book was: to provide amateurs as well as naturalists with a guide enabling them to identify the native tree species of **Argentine Patagonia** (comprising the large area from the *Río Colorado* to the south) **and Chilean Patagonia** (taken from *Valdivia* southwards), as well as about 95% of the arboreal species introduced into these regions. As far as the text is concerned, a few explanatory remarks may be helpful:

- *Native* species and cultivated *pines* have received a somewhat more detailed description than the introduced, largely ornamental species. The criterion was to foster the knowledge of the native trees and of those species employed for extensive afforestations.
- The *keys* for the identification lead to *groups* which encompass a maximum of 12 genera or species. Within these groups, the illustrations and the descriptions should easily allow to determine the plant in question.
- The entries on the *toxicity* and the *uses in medicine* are very concise and held in general terms; readers are referred to the works by Harborne et al. (1999), van Wyk and Wink (2004), Chevallier (2001), Roth et al. (1994), and E.H. Rapoport et al. (2003, 2005), respectively.
- Remarks on the use of the *wood* and on *other uses* are based on various sources and on personal observations and experience.

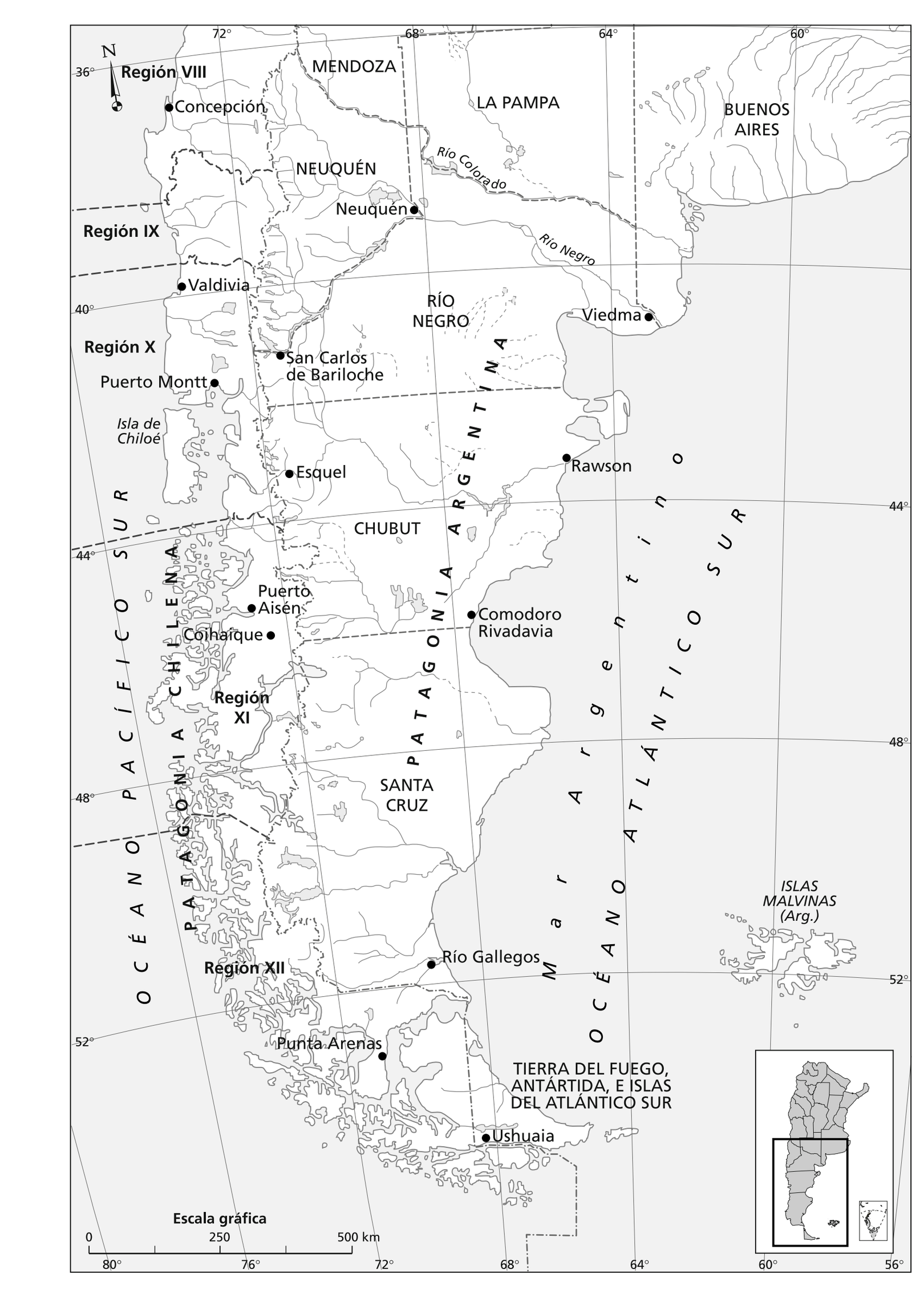
– Regarding the **photographs of the introduced species**, a further remark is necessary: Many of these trees, above all ornamental species, are often pruned in a way or kept under conditions that do not allow them to develop to their full size. In some cases, I was not able to find in Patagonia specimens with a really characteristic and photogenic crown. I then chose to insert photographs showing the *shape* of mature trees of these species growing in other regions of the world. The photographs of the leaves and barks, however, have almost exclusively been taken from Patagonian trees.

The beginnings of the work on this book go back to 1999, when I devised a *Begleiter zu Baumarten Argentiniens,* an elementary "companion" for the identification of about 200 arboreal species of Argentina, which served the Swiss participants of an extensive excursion through Argentina in 2000. That same year, my friend Guido Vittone helped me to get more intimately acquainted with the region of Puerto Blest. Years later, Guido showed me the regions of Los Antiguos and the Río Baker (Chile). In 2001, I conceived the idea of amplifying the modest manual of 1999. In discussions with friends and in several excursions through Argentine territory, I realised that there was no book available for the identification of trees of Argentine and Chilean Patagonia which included the species introduced for afforestations, wind-barriers, and for ornamental reasons. In 2003, Ingeniero Adrián Sáez introduced me to Ingeniera María Paula Guzzetti, who in March 2004 led me through the regions of Esquel - El Bolsón. Excursions to the regions of Valdivia, Puerto Montt, and Chiloé, which I undertook in September-October 2004, contributed to widen my horizon and to increase the number of collected species. In February-March 2005, I devoted a long journey through towns and villages of Argentine Patagonia to collect tree-species I had overlooked in my earlier excursions. Another journey, in September-October 2006, allowed me once more to study the flora of the regions of Valdivia and Puerto Blest. In February 2007, a further excursion led me to Río Gallegos, El Calafate, Puerto Natales, and Punta Arenas. Finally, in January-February 2008, I completed my field work with an excursion to Bariloche, El Bolsón, PN Lago Puelo, PN Los Alerces, Esquel, Futaleufú, PN Lago Rosselot, Coihaique, Lago General Cabrera / Buenos Aires, and Los Antiguos.

Due to the enormous surface and the complexity of the terrain, it is not surprising that the overall concept of the book has undergone several modifications in the course of time and with the progress of my work. Especially, aiming at covering Argentine as well as Chilean Patagonia has made it necessary to consult papers and maps on the geology, climate, soils, and vegetation of both countries. In many cases, I have tried to design diagrams reassembling data from studies on various localities.

The introductory chapters (**2–5**) are conceived to transmit fundamental information on the *delimitation* of what is termed 'Patagonia', as well as on the *geology, climate, soils*, and *vegetation* of Southern South America. In the following chapters **6–11**, I have first described what is being meant by the term 'tree' in our guide, and I have then striven to convey some basic knowledge of the different groups of trees described in the manual. The descriptions of the genera and species are reserved to the chapters **12–14**, whereas the next chapters (**15–18**) are devoted to concise contributions on afforestations, fruit trees, urban trees, and national parks. Finally, chapter **19** is devoted to Carl Skottsberg and his remarkable expedition through Patagonia, a hundred years ago.

Fig. 1.1: Overview of Argentine and Chilean Patagonia


N
72°
68°
64°
60°
36°
Región VIII
MENDOZA
LA PAMPA
BUENOS AIRES
Concepción
Río Colorado
NEUQUÉN
Neuquén
Región IX
Río Negro
Valdivia
40°
RÍO NEGRO
Viedma
Región X
San Carlos de Bariloche
Puerto Montt
Isla de Chiloé
Esquel
Rawson
44°
CHUBUT
Puerto Aisén
Comodoro Rivadavia
Coihaique
Región XI
48°
SANTA CRUZ
ISLAS MALVINAS (Arg.)
Río Gallegos
Región XII
52°
Punta Arenas
TIERRA DEL FUEGO, ANTÁRTIDA, E ISLAS DEL ATLÁNTICO SUR
Ushuaia
OCÉANO PACÍFICO SUR
CHILENA
PATAGONIA
ARGENTINA
PATAGONIA
Mar Argentino
OCÉANO ATLÁNTICO SUR
Escala gráfica
0
250
500 km
80°
76°
72°
68°
64°
60°
56°

2. How to use this guide for identifying trees

Most users of manuals for identifying plants tend to avoid dichotomous keys whenever they can. But to wildly thumb through a book looking at pictures is not the best alternative. That is why I have chosen to offer a list of plant groups which can easily be separated from each other by clearly discernible vegetative traits common to all the species contained in the respective groups. In several cases, I have added synoptic or dichotomous keys in order to provide a better founded identification. This is the case e.g. in *Cupressus, Eucalyptus, Nothofagus, Pinus, Populus, Prunus, Quercus.*

It is my experience that a user quite often has already a general idea of the name or taxonomic position of the tree she or he is looking at. In these cases, it is advisable to search for the illustrations in question – and then to check whether the tree fits the *group-characters* (e.g.: *Are the leaves truly trifoliate and alternate* → G 12?), and finally compare the real tree with the description of the species it presumably belongs to.

Regarding the native trees, as well as those *coniferous species* used on a large scale in *afforestations*, I have described every single species separately, i.e. each species has an entry of its own. In the case of the genera *Pinus* and *Nothofagus*, with numerous species growing in Patagonia, I have first given a characterisation of the genus, which is then followed by the descriptions of the species.

As far as *all the other introduced species* dealt with in this manual are concerned, single entries for every species is the rule if only one or, in some cases, two species of a genus are considered. In certain cases, however, in which several, closely related species of one genus have been introduced into southern South America, I have preferred to offer a description of the characters of the genus, adding a key to distinguish the most common species found in Patagonia. This procedure was used for the following genera: *Acer, Alnus, Betula, Crataegus, Cupressus, Eucalyptus, Fraxinus, Populus, Prunus, Quercus, Sorbus, Tilia,* and *Ulmus*. Heed must be taken that these keys always lead to a *selection* of the species which can be found in Patagonia.

The description of the species included in our manual is reserved to the chapters **12** (gymnosperms [conifers]), **13** (angiosperms–dicots) and **14** (angiosperms–monocots), respectively.

The manual does *not* cover all the tree species grown in the vast territory of Argentine and Chilean Patagonia; but I have attempted to include all the species inhabitants of Patagonia daily live with, as well as those other trees excursionists travelling through this beautiful region of our planet are likely to come across, thereby including many plants which – from a very strict point of view – can hardly be considered to be true trees (e.g. *Cordyline australis, Yucca elephantipes*, *Desfontainia spinosa, Chusquea coleou*). This latter feature is a practice followed by several outstanding, modern books on trees (e.g. More and White (2003), López Lillo and Sánchez de Lorenzo Cáceres (2001)).

3. Southern South America and the term 'Patagonia'

Trees in Patagonia – our book's title – refers in a general, open sense to the vast region in southern South America which is also addressed as *El Cono Sur*, but better known in the entire world as *Patagonia*. The exact meaning of this latter term, however, is still a matter of controversy, a fact that immediately falls into one's attention by looking at several attempts to set clear cut boundaries to the region termed 'Patagonia'. Let us consider a few examples:

R. Magin Casamiquela (in *Guía turística YPF* [of the República Argentina](1998)) distinguishes *Eastern Patagonia* from *Western Patagonia*. According to this author, the northern and southern boundaries of these two regions can be defined as follows:

Eastern Patagonia comprises the area between the river Colorado in the north and the Strait of Magellan in the south.
Western Patagonia (following C. Keller) extends from the lake Todos los Santos and its draining river Petrohué down to the Strait of Magellan, thereby excluding the Isla Grande de Chiloé but with the inclusion of the archipelagos from Chiloé to the Strait of Magellan.
For practical reasons, however, the authors of the *Guía turística YPF* conveyed to the term 'Eastern Patagonia' a very broad meaning, referring by it also to the archipelago of Tierra del Fuego *and* to the Islas Malvinas / Falkland Islands.
On the basis of this pragmatic approach, it would simply be a matter of consequence to incorporate Chiloé and the archipelago of Tierra del Fuego into the realm of what is meant by 'Western Patagonia'.

C. Runcinan (ed.) and the co-authors of *Time Out. Patagonia* (2002) call *Western (Chilean) Patagonia* the entire region to the south of the river Bío Bío, including Temuco and the Lake District. With regard to *Eastern (Argentine) Patagonia*, the guide refers to the region comprised between the river Colorado and the south of Tierra del Fuego.

S. Blackwell (ed.) and the co-authors of *Footprint Patagonia* (2005) define 'Western Patagonia' the same way as Runcinan et al. Concerning *Eastern Patagonia,* this guide even expands the region to some areas located to the north of the river Colorado.

R. Gantzhorn, in *Patagonien – Trekking Guide* (2004), considers the Chilean side of Patagonia to spread from the river Bío Bío in the north (the latitude of which is equivalent to that of the river Colorado on the Argentine side – the northern limit of *Eastern* Patagonia, according to Gantzhorn) down to Cape Horn.

W. Bernhardson, in *Moon Handbooks Patagonia* (2005), admits that the term 'Patagonia' "is notoriously hard to define, but for purposes of this book, it's a pragmatic matter… On the Argentine side, it comprises the provinces of Neuquén, Río Negro, Chubut, Santa Cruz, and Tierra del Fuego, while in Chile it includes the lake-district jurisdictions of La Araucaria (Region IX) and Los Lagos (Region X), plus Patagonia proper, Aisén (Region XI) and Magallanes (Region XII)" (p. 5). This means that for Bernhardson Patagonia covers the same area as for Runcinan and Gantzhorn.

R.R. Rodríguez avoids the term 'Patagonia' (in his article "Forests of southern Chile and its main components" [in Spanish], in J. Grau y G. Zizka (eds.), *Flora silvestre de Chile* (1992)) and only refers to the "Subantarctic Province which in Chile stretches along mountains and valleys from the south of the river Bío Bío (ca. 37°S) to Cape Horn (ca. 56°S)" (p.44). In other words: Rodríguez's term 'Subantarctic Province' is virtually equivalent to what Gantzhorn, Blackwell et al., and Runcinan et al. define as '(Western) Patagonia'.

M. Graham, on the other hand, uses (in *Chile* (2003)) the expression 'Southern Patagonia' to designate the region confined to the comparatively small sector between the National Park Torres del Paine and the Strait of Magellan.

F. Ranft (ed.) and the co-authors of *Chile, Osterinsel* (2004) employ the term 'Patagonia' when describing the "southern cone on the Argentine and the Chilean side of the Cordillera" (p. 61), without entering into any further details.

H.A. Schultz, E. Jones, C. Jones, in *Argentina* (ed. D. Bull, 1988), write that *Patagonia* stretches from the river Colorado in the north to Cape Horn in the south, belonging both to Chile and Argentina (p. 214), and avoid details about its northern limit in Chile.

In *Flora Patagónica (República Argentina),* the masterly reference work directed by M.N. Correa, the limits of Continental Patagonia are defined "to the N by the river Colorado, to the S by the canals of Beagle and Moat, to the W by the Cordillera de los Andes, and to the E by the Atlantic Ocean and the islands of the Southern Atlantic" (vol.VIII, 1998, p. 1).

Grau, in *Flora de Chile (vol. I, 1995),* does not specify the boundaries of Patagonia, but the context seems to indicate that he restricts it to the region confined to the area between the National Park Torres del Paine and the Strait of Magellan (p. 88).

Summing up these selected opinions and taking into consideration that our book includes the arboreal species of the evergreen (Valdivian) rain forests, which extend from Valdivia to the southernmost areas of the continent, I shall use – for *practical reasons* – the term 'Patagonia' in a very wide sense, largely pre-conceived by R.M. Casamiquela:

Western (Chilean) Patagonia: Region that stretches from Valdivia to Cape Horn. It comprises the Administrative Regions X, XI, and XII.

Eastern (Argentine) Patagonia: Region that stretches from the river Colorado to the archipelagos of Tierra del Fuego and includes the islands of the Southern Atlantic. It comprises the Argentine Provinces of Neuquén, Río Negro, Chubut, Santa Cruz, and Tierra del Fuego.

4. Geology, climate, and soils of Patagonia

Fig. 4.0: Río Ibáñez, Chile (01.02.2008, afternoon)

Within the scope of our book, I shall only dwell on a few geologic, climatologic, and edaphic features of *Patagonia* – always in the widest sense of the term –, concentrating on the most important abiotic factors for the development of the vegetation in these regions of the world.

4.1. Geo-morphological structure

From northern Argentina and Chile down to latitude 37° S, the *Cordillera de los Andes* appears as a broad central mountain chain, the highest peaks of which usually determine the political borderline between the two countries. From latitude 37.5° S southwards, the Cordillera separates itself into two chains, divided by the river Bío-Bío which flows from southeast to northwest and runs into the Pacific Ocean to the south of Concepción. Over a long distance, the border-chain is lower than the western chain with its high volcanoes (Tolhuaca [2780 m], Lonquimay [2890 m] and Llaima [3125 m above sea level]).

From 40° S to 52° S the Cordillera de los Andes follows approximately the line of the 73°W meridian. Further to the south, the Cordillera draws a broad arc to the south-east, eventually reaching Cabo San Diego, at the eastern end of Tierra del Fuego, and the Isla de los Estados while running roughly parallel to latitude 54° 45' S. On a length of nearly 1800 km, the Cordillera de los Andes divides the entire Patagonian sector of South America into two completely different regions: *Western Patagonia* and *Eastern Patagonia*.

Fig. 4.1: Patagonian Area of the Geologic Map of South America, 1 : 3 000 000.– **CGMW-CPRM-DNPM-UNESCO, Brasília, 2000.** (Reproduced with the kind permission of C. Schobbenhaus)

Simplifi ed legend of the continental area

A: paleo-archean, metamorphic rocks
paleo-arqueano, rocas metamórficas

My: meso-proterozoic, volcanic rocks, acid and intermediate
meso-proterozoico, rocas volcánicas, ácidas e intermedias

N, N2: neo-proterozoic, metamorphic rocks
neo-proterozoico, rocas metamórficas

P+, CP+, DC+, Є+, PZ1+, PZ2+, Є0+: paleozoic, plutonic rocks, acid and intermediate
paleozoico, rocas .plutónicas, ácidas e intermedias

PZS: paleozoic, metamorphic rocks, undifferentiated
paleozoico, rocas metamórficas, no diferenciadas

CP, D, DC, Є, Є0, O, P, S, SD, PZ1, PZ2: paleozoic, sedimentary rocks★
paleozoico, rocas sedimentarias★

PTR, PZ2MZ1: paleozoic–mesozoic, sedimentary rocks★
paleozoico-mesozoico, rocas sedimentarias★

PTRy: paleozoic–triassic, volcanic rocks★, acid and intermediate
paleozoico-triásico, rocas volcánicas★, ácidas e intermedias

TR, J, K, JK, MZ, TrJ: mesozoic, sedimentary rocks★
mesozoico, rocas sedimentarias★

Jv, Kv, JKv: mesozoic, volcanic rocks★, undifferentiated
mesozoico, rocas volcánicas★ , no diferenciadas

Jy, Ky: mesozoic, volcanic rocks★, acid and intermediate
mesozoico, rocas volcánicas★ , ácidas e intermedias

Jx: jurassic, plutonic rocks, undifferentiated
jurásico, rocas plutónicas, no diferenciadas

J+, K+: mesozoic, plutonic rocks, acid and intermediate
mesozoico, rocas plutónicas, ácidas e intermedias

JT+: jurassic-tertiary, plutonic rocks, acid and intermediate
jurásico-terciario, rocas plutónicas, ácidas e intermedias

T+: tertiary, plutonic rocks, acid and intermediate
terciario, rocas plutónicas, ácidas e intermedias

KT1v: cretaceous-tertiary, volcanic rocks, undifferentiated
cretáceo-terciario, rocas volcánicas, no diferenciadas

T, T1, T2: tertiary, sedimentary rocks★
terciario, rocas sedimentarias★

Tv, T1v, T2v: tertiary, volcanic rocks★, undifferentiated
terciario, rocas volcánicas★ , no diferenciadas

T1y, T2y: tertiary, volcanic rocks★, acid or intermediate
terciario, rocas volcánicas★ , ácidas o intermedias

T^, T1^, T2^: tertiary, volcanic rocks★, basic and intermediate
terciario, rocas volcánicas★ , básicas o intermedias

T2Q^: tertiary-quaternary, volcanic rocks★, basic and intermediate
terciario-cuaternario, rocas volcánicas★ , básicas e intermedias

TQ, T2Q: tertiary-quaternary, sedimentary rocks★
terciario-cuaternario, rocas sedimentarias★

Q: quaternary, sedimentary rocks★
cuaternario, rocas sedimentarias★

Sa: salt pans
salares

Gl: glaciers
glaciares

▲: volcanoes
volcanes

★ **+ volcano-sedimentary rocks**

Western (Chilean) Patagonia is, on the whole, an extremely rugged terrain and, as far as geology matters, one of the most restless regions of the world. It shows a remarkable cenozoic volcanic activity with widespread ash-rich eruptions (in central and southern Chile, more than 30 volcanoes have erupted at least once within the last 100 years), and it is the site of ongoing tectonic movements, a phenomenon correlated to frequent tremors and earthquakes.

A very characteristic feature of Central Chile and the Lake District between Valdivia and Puerto Montt is the classic longitudinal tripartite division into a Coastal Range *(Cordillera de la Costa),* a long fault *(Valle Central)* – which extends from north to south over a length of 1000 km and can be traced down to the southern border of Chiloé –, and the (eastern) *Cordillera de los Andes.*

Beyond the latitude of Puerto Montt (41° 28' S), the Coastal Range forms a chain of approximately 3000 hilly islands – the largest being Chiloé – extending along a fjord-lined coast to Cape Horn, only interrupted by the Península de Taitao (46° 30' S), a relic of the triple longitudinal structure found from Puerto Montt to the north. From Valdivia down to the Península de Taitao, the Cordillera de la Costa consists mainly of paleozoic sediments (PZS in **Fig. 4.1**). These can also be found in the south-western areas of Tierra del Fuego and the adjacent islands.

The Central Valley has thick layers of quaternary sediments (Q), whereas the Cordillera Principal shows a very complex structure, with mesozoic (J+, K+, JKv) and mesozoic-tertiary elements (JT+) predominating down to latitude 46°, followed by a large area of paleozoic rocks till latitude 50°, from where onwards to the south the mesozoic again prevails. Enormous glaciers (Gl) extend from 47° S to 51° S.

Eastern (Argentine) Patagonia represents a stark contrast to the western side: Covering an area of about 765720 km^2 (the surface of the provinces of Neuquén, Río Negro, Chubut, and Santa Cruz, i.e. 27.5% of the total surface of Argentina), the region between the Río Colorado and the Strait of Magellan appears, in very general terms, as a tableland which in the western zone of transition, between the Cordillera and the classical plateau, rises to an altitude of 900 m (at places, 1500 m), descending in a series of broad, flat steps towards the Atlantic coast, where high cliffs of up to 90 m along the shoreline are not uncommon. Several deep valleys cut the steppe from west to east, but only a few of them carry a permanent stream of Andean origin (Ríos Colorado, Negro, Chubut, Senguer, Chico, Santa Cruz). The bays of these larger rivers are those sites of the Patagonian coast where port facilities and settlements have been built.

Above all in the north-western areas, Eastern Patagonia fundamentally has emerged on the remnants of extra-Andean cratons that have hardly undergone any relevant processes of mountain formation since precambrian times. The outcrops of these proterozoic, weathering resistant, crystalline rocks (N in **Fig. 4.1**, e.g. in the region of the Río Limay) form hilly areas which rise above the flat terraces that are basically built up of layers of sedimentary rocks. According to M.E. Teruggi (1998), approximately 66% of extra-Andean Patagonia consists of "soft rocks" (rocas blandas), all of them pyroclastic, issued from volcanic explosions. As regards "hard rocks" of volcanic origin (e.g. Jy), there exist vast outcrops in south-eastern and central areas of the Province of Río Negro and to the south of Río Deseado (Province of Sta. Cruz). Thus, large areas of the Eastern Patagonian Steppe are covered by mighty strata of mainly mesozoic and cenozoic sediments of volcanic origin. Today, vast areas of the Patagonian steppe do not show any volcanic activity and are largely safe from seismic events.

Marine sediments dating from the paleozoic, triassic, and early jurassic periods are due to transgressions from western *Pacific* waters, since the separation of what was to become South America from the ulterior Africa – a process that led to the opening of the Southern Atlantic Ocean and to its advancement to lower (equatorial) latitudes – seems to have begun towards the end of the jurassic period. Parallel to the incipient rise of the Andes at the end of the cretaceous, the Atlantic Ocean flooded at intervals vast areas of Sta. Cruz and Tierra del Fuego, and around Península Valdés. When it receded, the Andes had formed a barrier that holds humidity back on the western slopes. In the course of the Plio-Pleistocene, mean temperature decreased dramatically in Eastern Patagonia and glaciers covered Tierra del Fuego and southern Sta. Cruz, extending in northern Sta. Cruz and in Chubut several hundred kilometres eastwards of the Andean summits. "During the Early Pleistocene, they probably reached the present Atlantic submarine platform several times" (Coronato et al., 2004, p. 49). Later, in the post-glacial period, a gradual warming up set on.

4.2. Climate

Pluviosity: Due to the predominant humid western winds, *Western Patagonia* as a whole relishes a high pluviosity. At latitude 40° S, the western slope of the Coastal Range (Cordillera de la Costa) may receive up to 4000 mm annually (= euhumid climate) (Valdivia, at 39° 48' S, and located in a bay, has an annual mean of 2700 mm); besides, it is particularly prone to become immersed in waves of marine fog. Towards the east, precipitation drops in the Valle Central to 1000–2000 mm (= humid climate), and it increases again on the west-exposed slopes of the Cordillera de los Andes.

On the *Argentine side,* pluviosity diminishes rapidly from west to east. With the exception of Puerto Blest and a few other, minor Andean windows, no major areas, and in particular no towns in *Eastern Patagonia* enjoy more than 1000 mm of annual rain (= semi-humid climate). There is a narrow *zone of transition* running from 39° S down to approximately latitude 47° S that receives about 400 mm of annual rainfall (= semi-arid climate), beyond which pluviosity decreases to 200 mm or less, a volume characteristic of most of Eastern Patagonia (= arid climate). Regarding the seasonal distribution of the scant rainfall, one can roughly say that *west* of longitude 71° W precipitation occurs during the winter months, whereas near the Atlantic coast in northern Patagonia (e.g. Viedma, Río Colorado) and in southernmost Patagonia (e.g. Río Gallegos, Río Grande (Tierra del Fuego)), the summer months have more rain, albeit on an extremely low level (33.8 mm for January in Viedma, compared to 23.1 mm for July; a similar ratio in Río Gallegos).

Temperature: On the *Chilean side,* Valdivia (39° 48' S; 73° 14' W) has a mean January temperature of 23° C and a mean July temperature of 11° C. From Puerto Montt (41° 28' S; 72° 57' W) southwards, daily as well as annual amplitudes diminish, and the coastal areas show an almost isotherm climate (see the climate diagrams of Puerto Montt and Isla Guafa).

On the *Argentine side,* the Atlantic Ocean has a moderating effect on the temperature of the coastal areas. This can clearly be seen by comparing the climates of Esquel Airport (42° 54' S; 71° 12' W; 785 m) and Puerto Santa Cruz (50° 01' S; 68° 31' W; 111 m), located 780 km further to the south: With an annual mean temperature of 8.6° C the latter town is even 0.1° C warmer than the former! Thus, the warming effect of the Atlantic Ocean on southern coastal areas is obviously only partially counterbalanced by the predominant dry and cold west winds. On the tableland, the daily and annual range of temperature-variation is very high.

Towards the southern tip of South America, the land masses narrow so rapidly that the Pacific Ocean partakes in the influence of the water surfaces on the temperature of the eastern sites.

A closer look at **Fig. 4.2.1** and at the climate diagrams of nine sites **(Fig. 4.2.2)** corroborates and illustrates what I have summarised. Particularly revealing is a glance at the changes in mean monthly rainfall and temperature from west to east, roughly along the latitude of S.C. Bariloche (41° 09' S), i.e. comparing the diagrams of Puerto Montt, S.C. Bariloche, Neuquén. As regards the climate diagrams of Bariloche Aéreo and Esquel Aéreo, it must be observed that these airports (both at 71° 12' W) are already located in the zone of transition, the towns of S.C. Bariloche (at 71° 18' W) and Esquel (at 71° 19' W) enjoying a significantly higher annual rainfall than their respective airports.

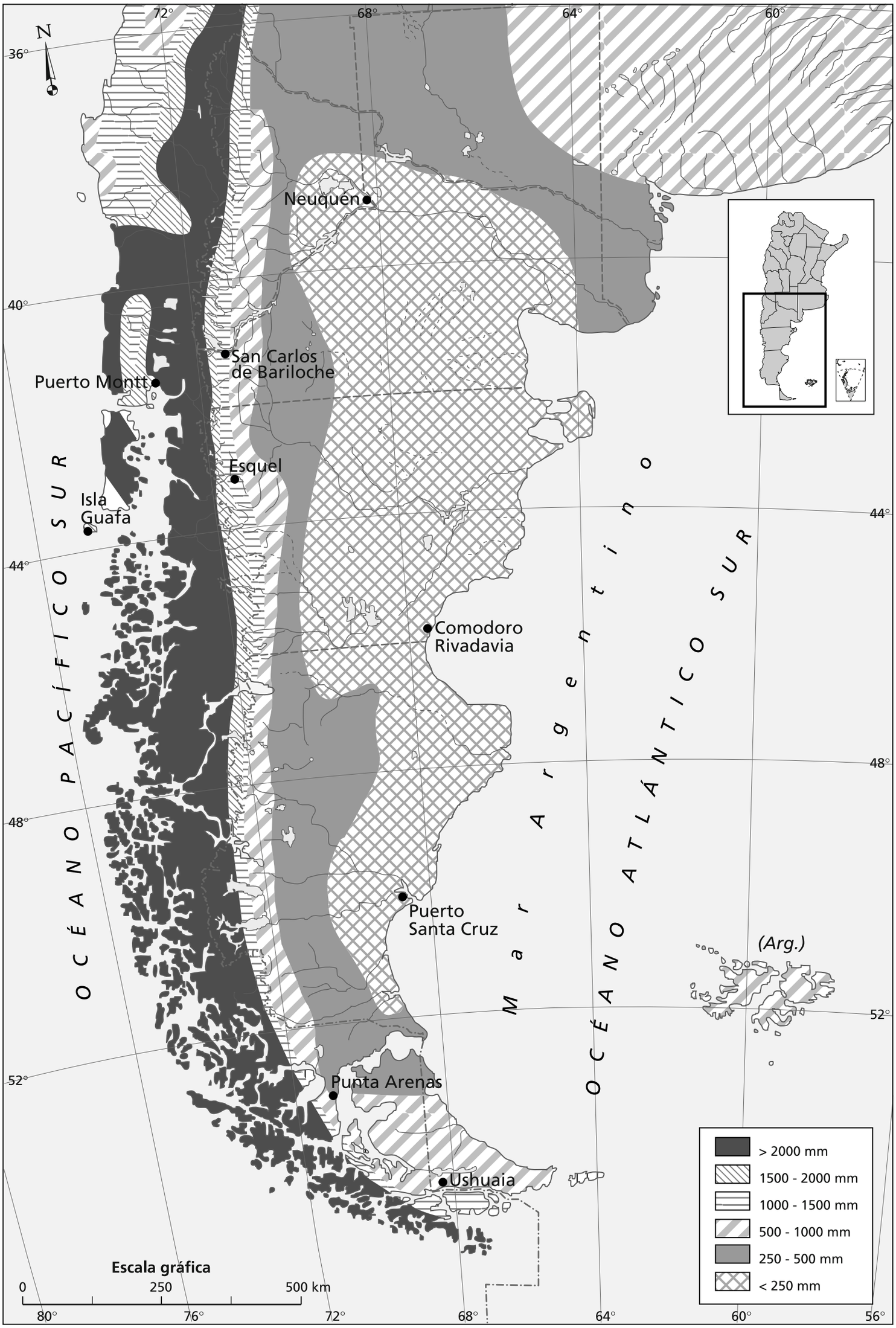

72°
68°
64°
60°
36°
N
Neuquén
40°
San Carlos
de Bariloche
Puerto Montt
Esquel
Isla
Guafa
44°
Comodoro
Rivadavia
48°
Puerto
Santa Cruz
(Arg.)
52°
Punta Arenas
Ushuaia
OCÉANO PACÍFICO SUR
Mar Argentino
OCÉANO ATLÁNTICO SUR
> 2000 mm
1500 - 2000 mm
1000 - 1500 mm
500 - 1000 mm
250 - 500 mm
< 250 mm
Escala gráfica
0
250
500 km
80°
76°
72°
68°
64°
60°
56°

Fig. 4.2.1 (left): Annual rainfall in Patagonia

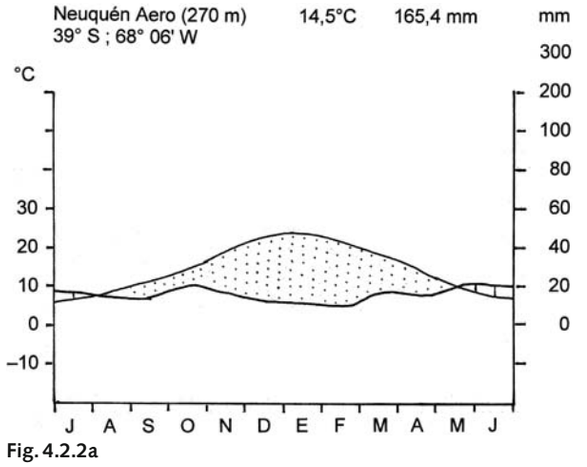


Fig. 4.2.2a

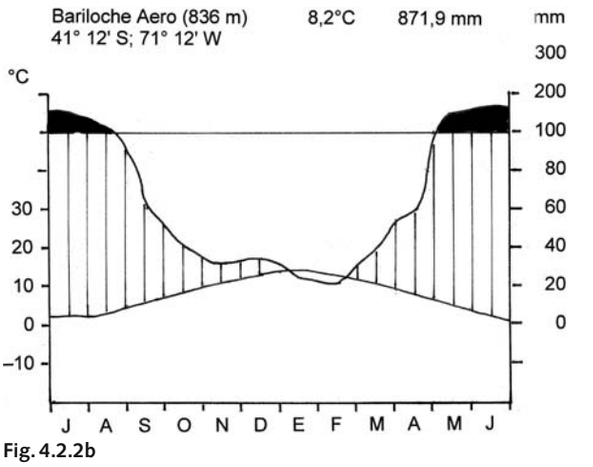


Fig. 4.2.2b

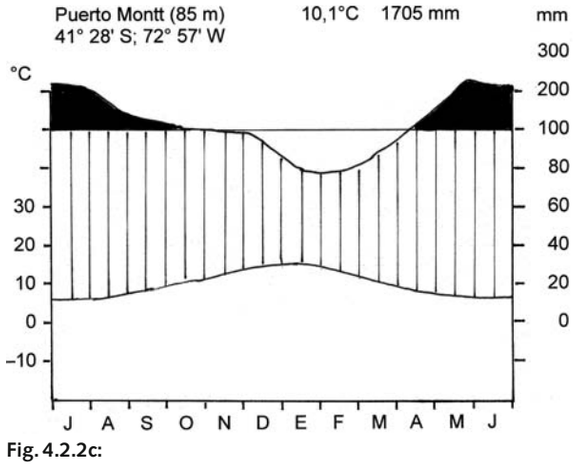


Fig. 4.2.2c:

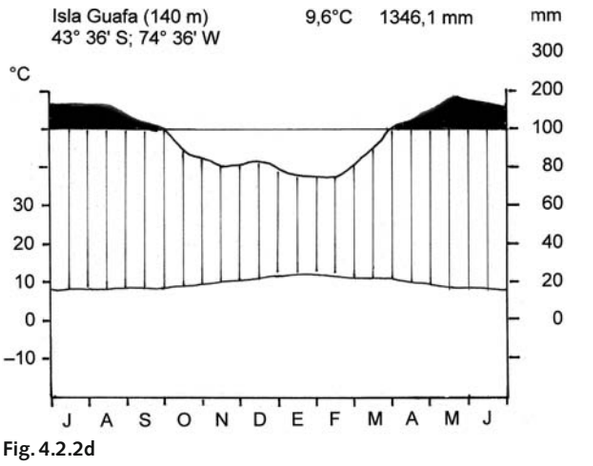


Fig. 4.2.2d

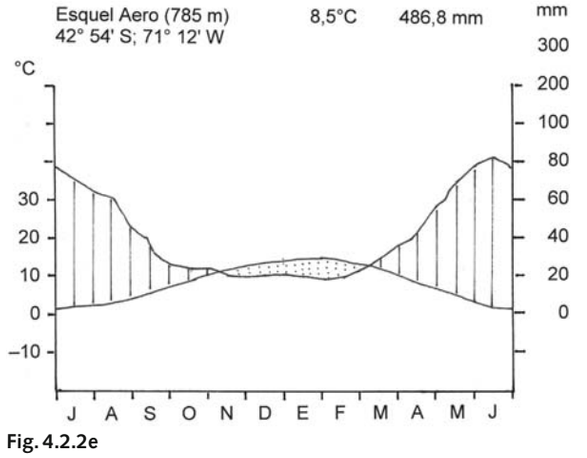


Fig. 4.2.2e

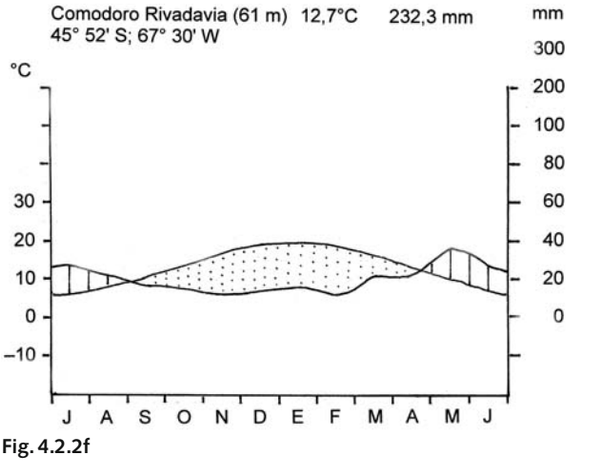


Fig. 4.2.2f

Fig. 4.2.2a–i: Climate diagrams of 9 Patagonian sites: **a:** Neuquén; **b:** San Carlos de Bariloche; **c:** Puerto Montt; **d:** Isla Guafa; **e:** Esquel; **f:** Comodoro Rivadavia; **g:** Puerto Santa Cruz; **h:** Punta Arenas; **i:** Ushuaia

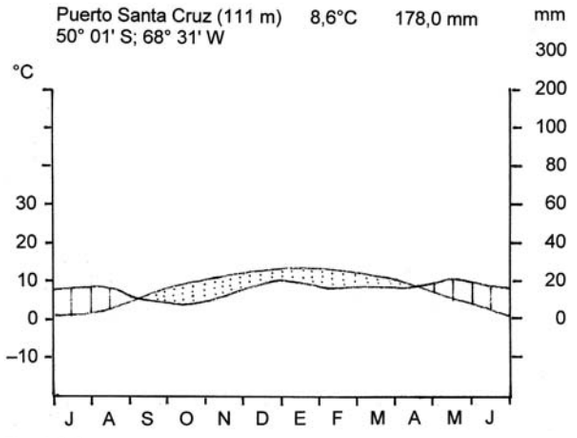


Fig. 4.2.2g

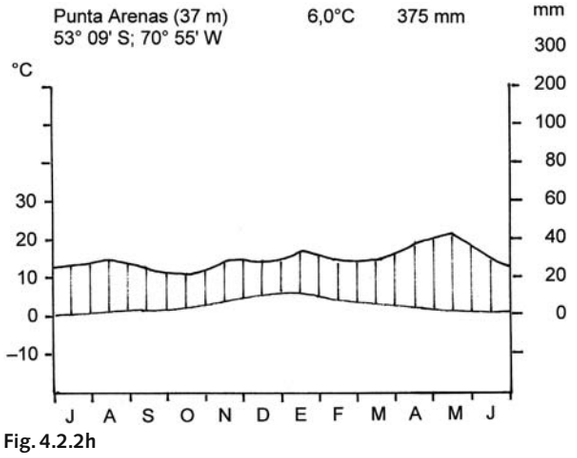


Fig. 4.2.2h

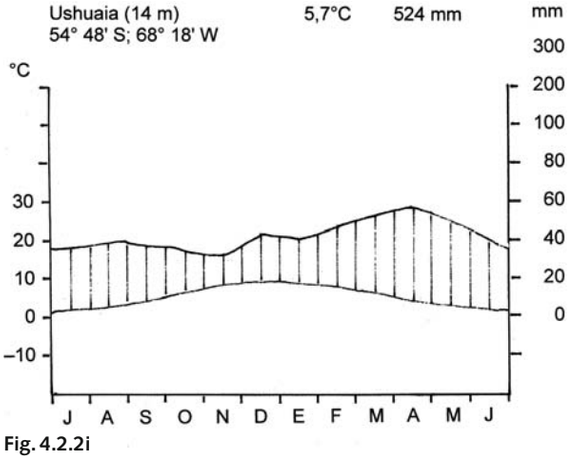


Fig. 4.2.2i

4.3. Soils

Soils have a double function for land plants: (i) they convey them physical support; (ii) they provide them with indispensable nutrients. Neither of these functions can be regarded as a constant. Soils change with time: they evolve, reach a stage of maturity, and they may involve, i.e. degenerate. In a broad sense, the evolution of a soil starts when the underlying mother rock begins to be covered by foreign material, issuing simultaneously in the appearance of an upper *A-horizon* and a *C-horizon* on the parental material. In the course of time, as manifold processes set on, other – *B-horizons* – develop between the *A- and C-horizons.*

When a soil reaches maturity, it has gained in stability. If it starts to degrade, the forming processes gradually invert, leading to soil destruction, often in form of water or wind erosion. Unfortunately, human mismanagement of soils has either initiated or accelerated these degenerating processes in many regions of the world. Vast areas of Eastern and Western Patagonia are sad examples of anthropogenic soil destruction.

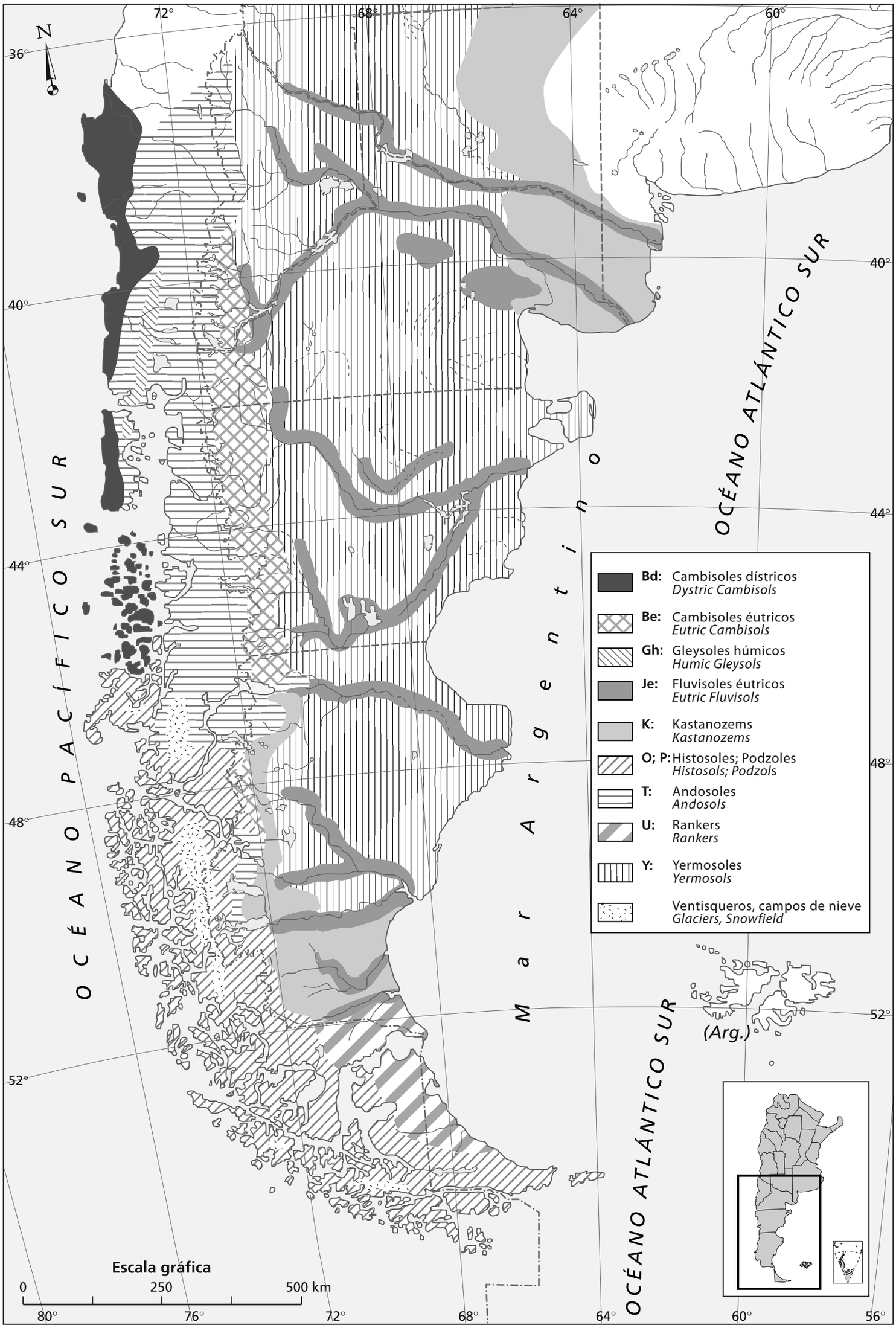
In very general terms, we could state that deep, moist soils with a rich and well developed *horizon A* can almost exclusively be found on the *Chilean side,* whereas on the *Argentine side* soils are mainly superficial, often alkaline, with an elevated amount of salt. Erosion is a serious problem on both sides of the Andes:

In *Chilean Patagonia,* the moist, wet soils are susceptible to be degraded through compaction, and erosion is favoured by the hilly landscape and the elevated rate of rainfall that washes out the organic matter (Ellies, 2000). Erosion is a major problem above all in Region IX on the steep slopes of the Cordillera de la Costa, where soils have evolved on granite rocks. Further to the south, in Region X, the soils have been formed of material stemming from glaciers, and are more recent (Hoffmann, 1982, p. 25).

In *Argentine Patagonia,* it is above all wind erosion, induced or strongly increased by overgrazing, that has caused a severe loss of the surface horizon of the soils (Moscatelli and Pazos, 2000).

Figure 4.3. conveys an extremely simplified overview of the main types of soils of Southern South America. It is a compilation, based on volume IV of the *Soil map of the world* (published by FAO– UNESCO in 1974), W. Zeil's *Südamerika* (1986), and on the *Encyclopaedia Britannica* (vol. 27, 1993, p. 588). I have chosen these publications, because they cover the entire surface of Southern

Fig. 4.3: Soils of Patagonia


N
72°
68°
64°
60°
36°
40°
44°
48°
52°
56°
80°
76°
OCÉANO PACÍFICO SUR
Mar Argentino
OCÉANO ATLÁNTICO SUR
OCÉANO ATLÁNTICO SUR
(Arg.)
Bd: Cambisoles dístricos
Dystric Cambisols
Be: Cambisoles éutricos
Eutric Cambisols
Gh: Gleysoles húmicos
Humic Gleysols
Je: Fluvisoles éutricos
Eutric Fluvisols
K: Kastanozems
Kastanozems
O; P: Histosoles; Podzoles
Histosols; Podzols
T: Andosoles
Andosols
U: Rankers
Rankers
Y: Yermosoles
Yermosols
Ventisqueros, campos de nieve
Glaciers, Snowfield
Escala gráfica
0
250
500 km

South America. Readers who search for more detailed information on the soils of Argentine Patagonia and who are familiar with the classification of the *Soil Taxonomy System* are referred to the publications by G. Moscatelli and M.S. Pazos (2000) and by C.O. Scoppa (1998).

A short description of the **soil types** considered in **Fig. 4.3:**

Bd: *Dystric Cambisols*. Poor, acid soils in mountainous areas with humid climate, having a base saturation of less than 50% and little biological activity. Lack of phosphate. Carbonates absent in the parental material. Rarely apt for agriculture, suitable for forestry and pasture. In Patagonia, above all on the western slopes of the Coastal Range. High risk of water erosion.

Be: *Eutric Cambisols*. Neutral soils in subhumid to semiarid zones of transition, having a base saturation of more than 50% and being biologically active. Carbonates absent in the parental material. Suitable for tree crops, forestry, pasture.

Gh: *Humic Gleysols*. Bluish grey soils, generally sticky, with excess wetness stemming from ground-water, having no abrupt textural change within 100 cm from the soil surface which is often covered by new organic material. In Patagonia, restricted to the fault of the Chilean Valle Central, where they have developed on sediments of Pleistocene age. Suitable for grazing, horticultural crops; if not drained, less suitable for crops with small seeds.

Je: *Eutric Fluvisols*. The better, neutral soils of Eastern Patagonia, developed on alluvial deposits, having a thickness of 25 cm (or more) and a base saturation of more than 50%. Drainage and irrigation may be needed in certain areas.

K: *Kastanozems*. Brown soils, rich in organic matter. Generally, soils in semiarid climates; rich in clay; in principle fertile, with a high content of calcium carbonate. Often with a high salt content that even may increase with inappropriate irrigation. Crops such as quinoa, potatoes, barley, and oats can be grown.

P; O: *Podzols and Histosols*. The *podzols* (**P**) are acid, poor soils, often in mountainous areas with high pluviosity in which generally iron and all weathering products are eluviated, leaving a bleached, ashy upper horizon. Usually, a dark coloured B horizon with illuvial alumino-organic complexes, with or without iron, develops, often combined with hard horizons (pans) cemented together by organic matter.–
The *histosols* (**O**) are peaty, organic soils, having 40 cm or more of organic material; mainly on the offshore islands of southern Chile. Constantly swept by salt-laden winds, these acid soils are low in fertility. When drained and properly managed, such soils may, in certain areas, be suitable for high-value market crops.

T: *Andosols*. Acid soils, common in the volcanic Andes, frequently on steep slopes. They have a very high rate of phosphate fixation and are therefore often not intensively farmed. If drainage is applied, they may shrink rapidly in volume.

U: *Rankers*. In Patagonia, acid, stony soils with a shallow A-horizon laying on rocks or sand rich in silicate, poor in calcium carbonate.

Y: *Yermosols*. Shallow, stony soils on old arid terraces and tablelands. Often saline or alkaline. There is a predominant water deficiency. Very susceptible to wind erosion, particularly when overgrazed. To the north of latitude 40° S (approximately), yermosols often have a strongly developed argilic (clay) B horizon.

Listing up these soils according to their *pH,* we can distinguish:

(i) acid soils: **Bd, O, P, T** – generally soils in semi-humid to euhumid climates;
(ii) neutral soils: **Be, Je** – soils in semi-humid to semiarid climates;
(iii) alkaline soils: **K, Y** – soils in semi-arid to arid climates

Wet soils: **O, Gh**
Mountain soils: **P, T**
Shallow soils on rock bed: **T**
Acid, stony soils: **U**
Alluvial soils: **Je**

5. Vegetation of Patagonia

Fig. 5.0: North-exposed slope of PN Lago Puelo, with strong predominance of *Austrocedrus chilensis*. In the background, Chilean Andes (28.01.2008, afternoon)

5.1. The Vegetation Map of South America by K. Hueck and P. Seibert (1981)

Figure 5.1 reproduces –with the kind permission of the Publisher, Elsevier (Munich) [Urban & Fischer]– the Patagonian sector of the *Vegetationskarte von Südamerika* by K. Hueck and P. Seibert (Stuttgart: G. Fischer, 1981, 2nd ed.). What follows, is a concise characterisation of the vegetation units according to K. Hueck and P. Seibert. Regarding the names of the species, I follow Zuloaga et al.; for Chilean species not mentioned by Zuloaga, I follow Hoffmann; in brackets, the differing synonyms used by Hueck and Seibert.

The fact that I reproduce the map by Hueck and Seibert does not imply that I agree with every detail contained in their publication. But I do believe that Hueck and Seibert's map offers a fitting *overview* of the vegetation units of the southern regions of Argentina and Chile. (For details regarding the biogeographic delimitations of the subantarctic sub region and its provinces, see Morrone (2000).)

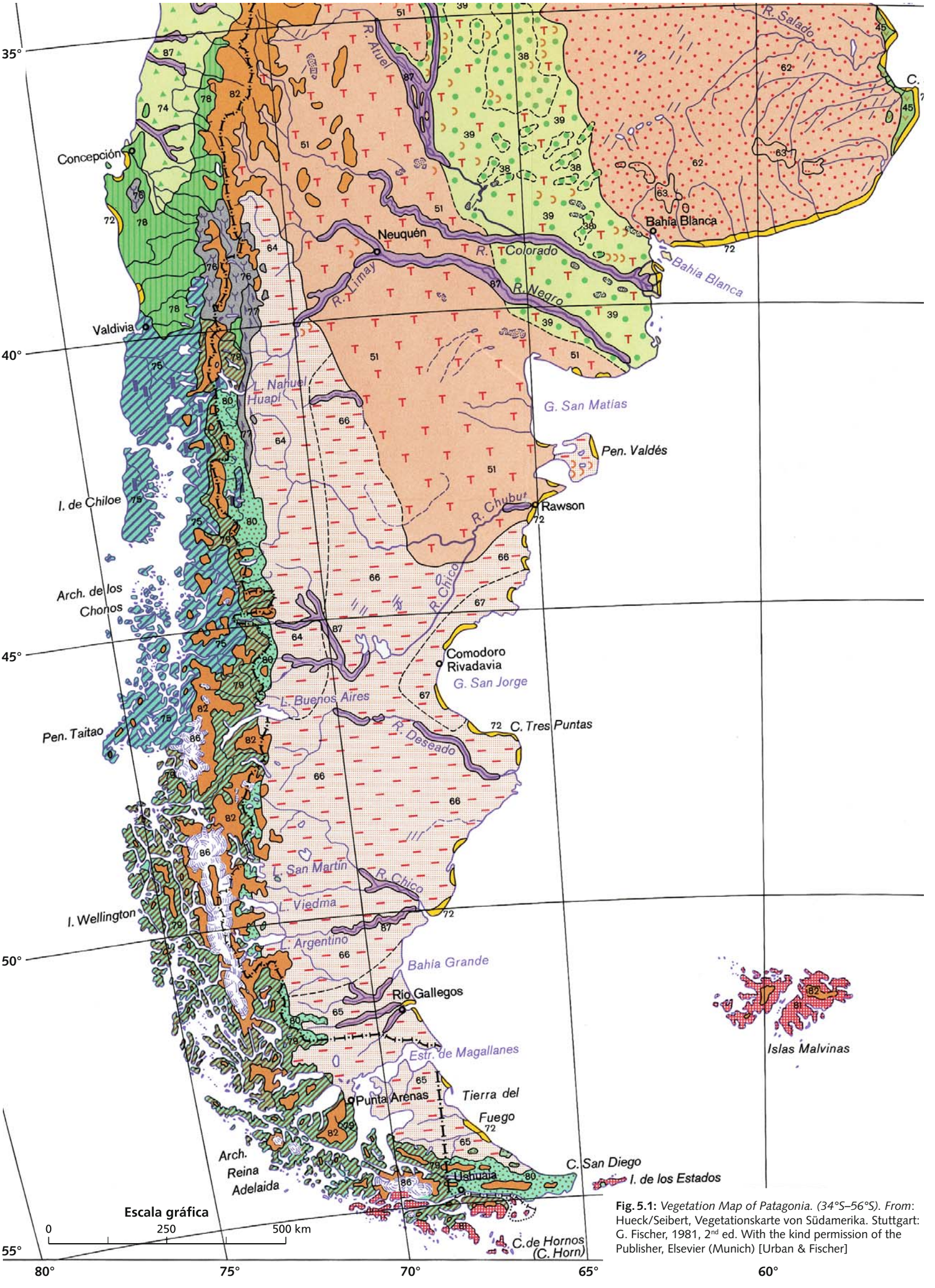


Fig. 5.1: *Vegetation Map of Patagonia. (34°S–56°S). From*: Hueck/Seibert, Vegetationskarte von Südamerika. Stuttgart: G. Fischer, 1981, 2nd ed. With the kind permission of the Publisher, Elsevier (Munich) [Urban & Fischer]


Dry forest of the Espinales
Bosques secos de los Espinales


Zone of transition from the dry forest of the Espinales to the Monte vegetation
Transición del bosque seco de los Espinales a la vegetación de Monte


Shrubby Monte steppe
Estepa arbustiva de Monte


Grassland of the Pampas plains
Praderas de las Pampas planas


Grassland and shrub-land of the hilly Pampas
Praderas y matorral de las Pampas onduladas


Patagonian steppes and half-deserts
Estepas y semidesiertos patagónicos

64 Sub-Andean and western region / *Sector subandino y occidental*

65 Tierra del Fuego and Magellanic region / *Sector de Tierra del Fuego y magallánico*

66 Central region / *Sector central*

67 San Jorge region / *Sector de San Jorge*


Coastal dunes and forests of coastal dunes
Dunas litorales y bosques de dunas litorales


High level of ground-water, very wet; in no. 58, 59, 62, 64–67, 72 flooded periodically or for long intervals
Alto nivel freático, muy mojado, periódicamente o largamente inundado en no. 58, 59, 62, 64–67, 72


Halophyte vegetation of the salt pans in no. 51, 64–67, 69
Vegetación halofitica de los salares en no. 51, 64–67, 69


Interrupted by or alternating with sand dunes in no. 51, 59, 64–67, 69
Interrumpido o alternado por médanos en no. 51, 59, 64–67, 69


Subtropical forests of xerophytes and sclerophytes of central Chile
Bosque subtropical de xerófitas y durifoliadas


Evergreen Valdivian rain forests
Pluviselva valdiviana siempreverde


Forests of *Araucaria araucana*
Bosque de Araucaria araucana


Forests of *Austrocedrus chilensis*
Bosques de Austrocedrus chilensis


Deciduous forests of the warm-temperate region, with *Nothofagus obliqua* and *N. alpina*
Bosques caducifolios de la zona templado-temperada con Nothofagus obliqua *y* N. alpina


Mainly evergreen forests of the temperate region, with *Nothofagus dombeyi* and *N. betuloides*
Bosques predominantemente siempreverdes de la zona templada con Nothofagus dombeyi *y* N. betuloides


Mainly deciduous forests of the temperate region, with *Nothofagus pumilio* and *N. antarctica*
Bosques predominantemente deciduos de la zona templada con Nothofagus pumilio *y* N. antarctica


Patches of *Fitzroya cupressoides* in the Valdivian rain forests
Fitzroya cupressoides *formando rodales en la pluviselva valdiviana*


Subantarctic tundra
Tundra subantártica


High altitude vegetation of the Andes without further differentiations
Vegetación andina de alta montaña sin mayor clasificación


Glaciers and snow fields
Ventisqueros y campos de nieve

Gallery-forests and other types of vegetation along rivers, in otherwise largely or completely treeless areas
Bosques de galería y otros tipos de vegetación asociados a ríos en zonas desarboladas o pobres en bosques

39: Zone of transition from the dry forest of the Espinales to the Monte vegetation

Distribution: In Argentina, between Río Negro and Córdoba.

Climate: 14–18° C mean annual temperature; range of variation: 14° C; 300–600 mm, in summer.

Elevation: 0–400 m.

Species: In dry forests: *Larrea divaricata*, *Prosopis affinis* (*P. algarobilla*), *P. caldenia, P. nigra, P. alba, Acacia caven, Geoffroea decorticans, Jodina rhombifolia, Schinus longifolia, Condalia microphylla* (*C. lineata*), *Celtis tala* (*C. spinosa*).

In palm groves: *Butia yatay*.– Only the south-eastern corner, with *Prosopis caldenia*, belongs to Patagonia, strictly speaking. [39 is equivalent to Roig's unity 14: Shrubby semiarid steppes of *Larrea divaricata* with *Geoffroea, Capparis*, etc.]

51: Shrubby Monte steppe

Distribution: In Argentina, from the foothills of the Andes to the Gulf of San Matías.

Climate: 14–20°C mean annual temp.; range of variation: 16° C; 100–350 mm, in summer. Elevation: 0–1000 m.

Species: **In the shrubby steppe:** *Larrea divaricata, L. ameghinoi, L. cuneifolia, L. nitida, Bougainvillea spinosa, Prosopis alpataco, P. strombulifera, Prosopidastrum globosum (Prosopis globosa), Senna aphylla (Cassia aphylla), Capparis atamisquea (Atamisquea emarginata), Condalia microphylla, Cercidium praecox (C. australe), Tricomaria usillo, Monttea aphylla, Chuquiraga erinacea*.

Halophyte vegetation: *Suaeda divaricata, Atriplex lampa, A. sagittifolia, Cyclolepis genistoides, Frankenia patagonica, Sarcocornia perennis (Salicornia ambigua), Heterostachys* sp., *Allenrolfea patagonica*.

[**51** is equivalent to Roig's unity 15: Shrubby semiarid steppes of *Larrea divaricata* with *Larrea ameghinoi*.]

62: Grassland of the Pampas plains

Distribution: In Argentina, from Río Uruguay to Bahía Blanca.

Climate: 14–17° C mean annual temp.; range of variation: 13°C; 600–1000 mm, in summer.

This region does not belong to Patagonia.

63: Grassland and shrub-land of the hilly Pampas

Distribution: Sierra de la Ventana (Prov. de Buenos Aires), Uruguay, southern Brasil.

Climate: 14–19°C mean annual temp.; range of variation: 13° C; 700–1300 mm, in summer.

Elevation: 0–1200 m.

This region does not belong to Patagonia.

64–67: Patagonian steppes and half-deserts [Shrubby arid steppes, after Roig]

64: Sub-Andean and western region of Argentine Patagonia

Distribution: Areas to the east of the Andes, between 38° S and 47° S.

Climate: 8–13°C mean annual temp.; range of variation: 13–15°C; 200–600 mm, in winter.

Elevation: 400–1500 (1900) m.

65: Tierra del Fuego and Magellanic region

Distribution: From latitude 51° S southwards.

Climate: 5–7°C mean annual temp.; range of variation: 9–10°C; 200–500 mm, in winter.

Elevation: 0–500 m.

66: Central region

Distribution: Central Patagonian, between 41° S and 51° S.

Climate: 8–14° C mean annual temp.; range of variation: 13° C; 100–200 mm, in winter.

Elevation: 0–1500 (1900) m.

67: San Jorge region

Distribution: Surroundings of the Gulf of San Jorge.

Climate: 0–11° C mean annual temp.; range of variation: 14° C; 100–200 mm, in winter.

Elevation: 0–500 m.

72: Coastal dunes [Coastal vegetation, after Roig]

Distribution: In Patagonia, only along the Atlantic coast.

Climate: → neighbouring regions.

Elevation: 0–40 m.

74: Subtropical forests of xerophytes and sclerophytes of central Chile

Distribution: Central Chile, between latitudes 31° S and 37° S.

Climate: 13–15° C mean annual temp.; range of variation: 5–12° C; 350–1500 mm, in winter.

Elevation: 350–1500 m.

This region comprises several types of forests and does not belong to Patagonia; however, several arboreal species grow in this region as well as in Patagonia, e.g.: *Nothofagus obliqua, Maytenus boaria, Azara* sp., *Myrceugenia* sp.– Typical species of this region include: *Peumus boldus, Lithrea caustica, Kageneckia oblonga, Cryptocarya* sp., *Jubaea spectabilis, Quillaja saponaria, Nothofagus obliqua, Schinus latifolia* (S. *latifolius*).

75: Evergreen Valdivian rain forests

Distribution: Chile, between latitudes 38/40° S and 47/49° S.

Climate: 10–12° C mean annual temp.; range of variation: 8° C; 2000–4000 mm, in winter.

Elevation: 0–500 m.

Species: **Forests of *Aextoxicon:*** *Aextoxicon punctatum, Eucryphia cordifolia, Laurelia sempervirens (L. aromatica), Laureliopsis philippiana (Laurelia serrata), Drimys winteri, Luma apiculata (Myrceugenella apiculata), Dasyphyllum diacanthoides (Flotovia diacanthoides), Gevuina avellana, Lomatia ferruginea, L. hirsuta, Maytenus boaria, Nothofagus obliqua, N. alpina (N. procera), Weinmannia trichosperma.*

Forests of Fitzroya: *Fitzroya cupressoides, Pilgerodendron uviferum, Saxegothaea conspicua, Podocarpus nubigenus, Nothofagus dombeyi, Lomatia hirsuta, Azara microphylla, Embothrium coccineum, Drimys winteri, Laureliopsis philippiana (Laurelia philippiana).*

Lowland forests: *Luma apiculata (Myrceugenella apiculata), Myrceugenia exsucca.*

76: Forests of *Araucaria araucana*

Distribution: Argentine-Chilean border area from 37° S to 40° S, and isolated patches in thee Cordillera de Arauco.

Climate: 10–15° mean annual temp.; range of variation: 14° C; 600 – >1200 mm, in winter.

Elevation: 600–1800 m.

Typical arboreal species: Araucaria araucana, *Nothofagus pumilio*, *N. antarctica*, *N. dombeyi*.

77: Forests of *Austrocedrus chilensis*

Distribution: Argentine-Chilean border area from 36° S to 44° s.

Climate: 7–10° C mean annual temp.; range of variation: 12° C; 600–1100 mm, in winter.

Elevation: 300–1500 m.

Typical arboreal species: Austrocedrus chilensis, Lomatia hirsuta, Maytenus boaria, Schinus patagonica (S. crenatas), Nothofagus antarctica, N. dombeyi.

78: Deciduous forests of the warm-temperate region, with *Nothofagus obliqua* and *N. alpina*

Distribution: Chile, between latitudes 36/38° S and 40/41° S.

Climate: 12–13° C mean annual temp.; range of variation: 7° C; 1000–2000 mm, in winter.

Elevation: 0–1000 (1200) m.

Extra-Patagonian region, adjacent to the Valdivian rain forests, having species in common with this latter region.

Main arboreal species: Nothofagus obliqua, *N. alpina* (*N. procera*), *Persea lingue, Eucryphia cordifolia, Aextoxicon punctatum, Laurelia sempervirens (L. aromatica), Gevuina avellana, Podocarpus salignus.*

79: Mainly evergreen forests of the temperate region, with *Nothofagus dombeyi* and *N. betuloides*

Distribution: Western slopes of the southern Cordillera, from 39° S to the southernmost tip of the continent (56° S).

Climate: 5–8° C mean annual temp.; range of variation: 7° C; 600 mm (in the south) – 4300 mm, in winter.

Elevation: Forests of *Nothofagus dombeyi* 0–1400 m; forests of *Nothofagus betuloides* 0–600 m.

Arboreal species: **Forests of *Nothofagus dombeyi:*** *Nothofagus dombeyi, Eucryphia cordifolia, Caldcluvia paniculata, Weinmannia trichosperma, Laureliopsis philippiana(Laurelia serrata), Podocarpus nubigenus, Drimys winteri.*

Forests of *N. betuloides:* *Nothofagus*

betuloides, Drimys winteri, Lomatia ferruginea, Azara lanceolata, Maytenus magellanica, Podocarpus nubigenus;
on swampy, boggy soils: *Pilgerodendron uviferum.*

80: Mainly deciduous forests of the temperate region, with *Nothofagus pumilio* and *N. antarctica* [Approximately equivalent to Roig's unities 2 (mesophilous forest) and 3 (hygrophilous forest, mixed with mesophilous forest)]
Distribution: Eastern slopes of the southern Cordillera, from 40° S to Tierra del Fuego.
Climate: 5–8° C mean annual temp.; range of variation: 9–12° C; 500–1500 mm, in winter.
Elevation: In the north: 1200–1700 m; in the south: 0–400 m.
Arboreal species: Nothofagus pumilio, N. antarctica.

81: Subantarctic tundra
Distribution: Tierra del Fuego and subantarctic islands.
Climate: 1–6° C mean annual temp.; range of variation: 6° C; 700–1000 mm.
Elevation: 0–1500 m.

82: High altitude vegetation of the Andes without further differentiations [approximately equivalent to Roig's unities 20 (high Andean tundra) and 21 (tundra of *Empetrum rubrum*, above all south of latitude 42° S]
Distribution: High mountains of the Andes.
Climate: Differs depending on latitude and altitude.
Elevation: 600–1500 m.

86: Glaciers and snow fields

87: Gallery-forests and other types of vegetation along rivers, in otherwise largely or completely treeless areas [hygrophilous or riparian vegetation, after Roig]
In **51**: *Salix humboldtiana.*
In **63**: *Salix humboldtiana, Ruprechtia salicifolia.*
In **64–67:** *Salix humboldtiana, S. fragilis, Ruprechtia salicifolia.*
In **74 (lowland forests):** *Luma apiculata (Myrceugenella chequen), Myrceugenia exsucca, Drimys winteri, Cissus striata, Maytenus boaria, Peumus boldus.*

5.2. Surveying the main vegetation units in cross-sections of Patagonia

The overview given by Hueck and Seibert can be completed by plotting the most important vegetation units on several W–E-cross-sections. Pioneering studies in this domain have been undertaken by A.L. Cabrera (1994) and K. Garleff (1977) for Argentine Patagonia and by C. Donovvso Zegers (1981, 1994) for the Chilean region, thereby including certain areas of Argentina. In **Fig. 5.2** and **Fig. 5.3a – 5.3d,** I have tried to combine and simplify the results achieved by these scientists. In **Fig. 5.3e**, I present the N–S-cross-section through the area of El Bolsón–Lago Puelo, based on the investigations by P. Seibert (1979) and on observations of my own.

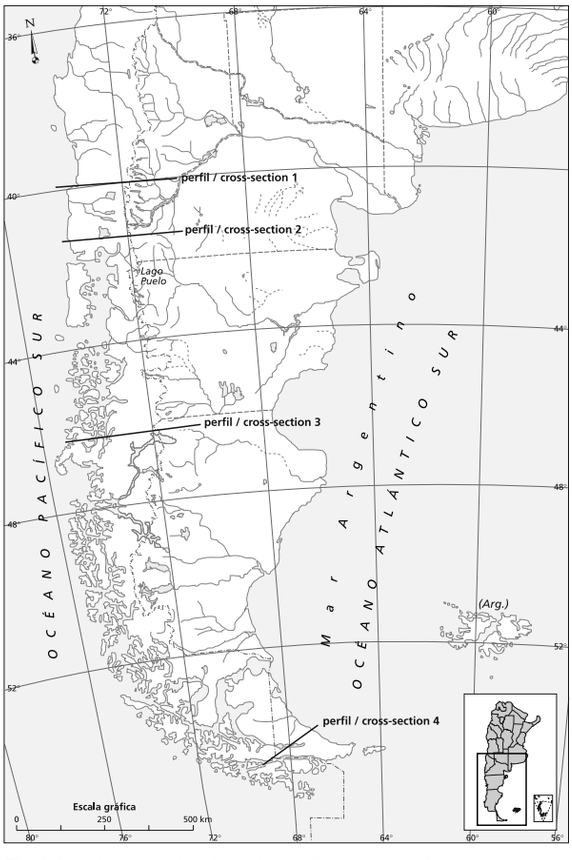


Fig. 5.2.: Map showing the sites of the cross-sections reproduced in Fig. 5.3. Map and cross-sections after Cabrera (1994), Garleff (1977), Donoso Zegers (1981, 1994) and Seibert (1979), modified

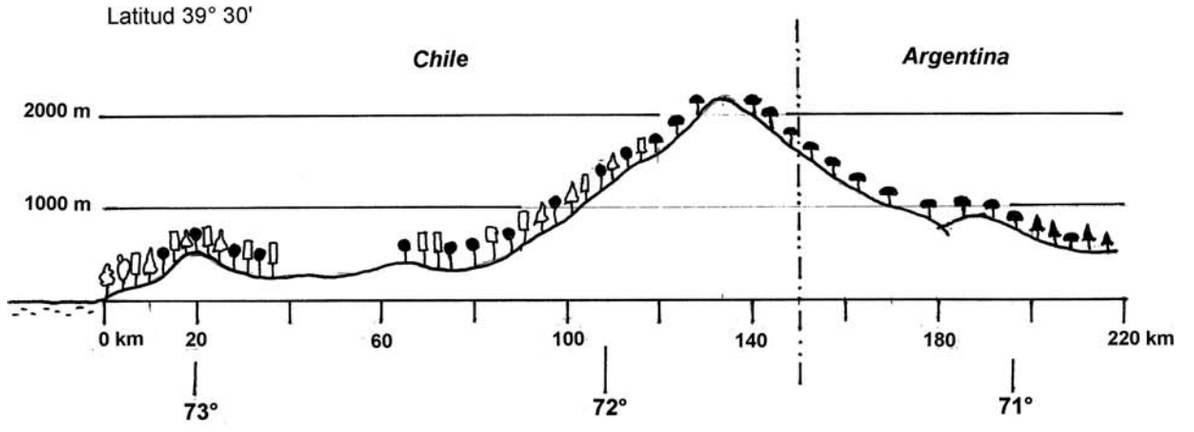


Fig. 5.3a: Cross-section at latitude 39° 30'

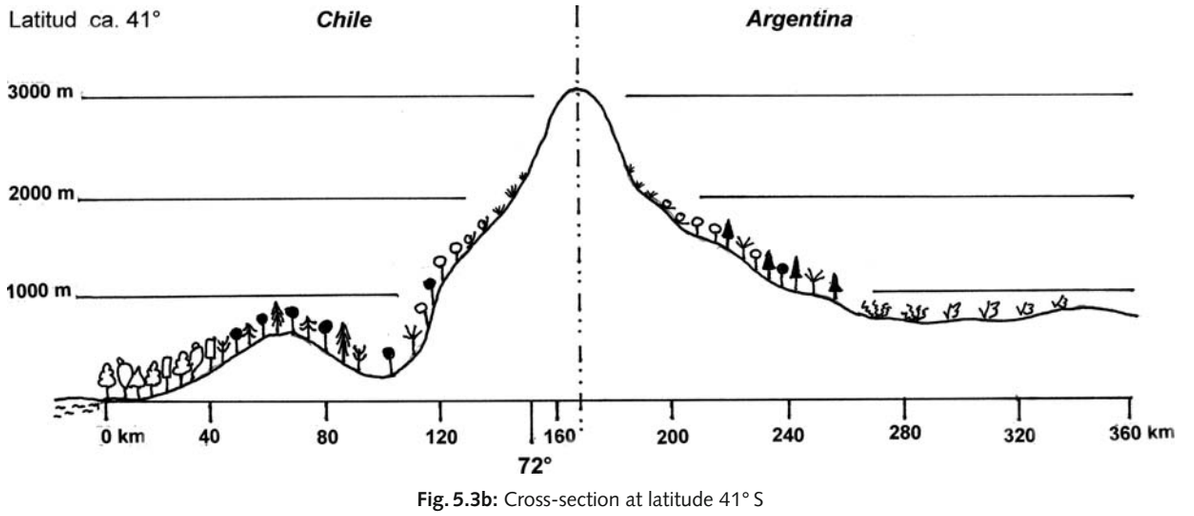


Fig. 5.3b: Cross-section at latitude 41° S

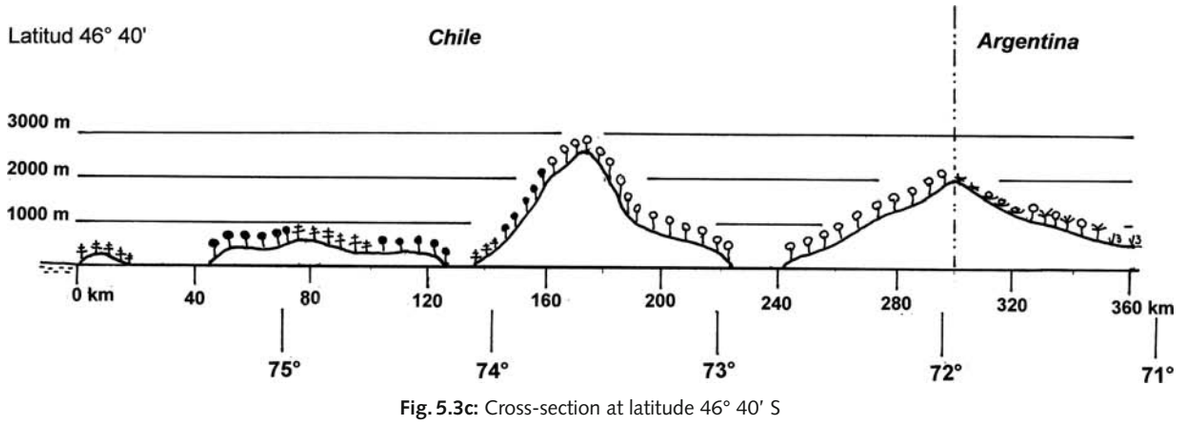


Fig. 5.3c: Cross-section at latitude 46° 40' S

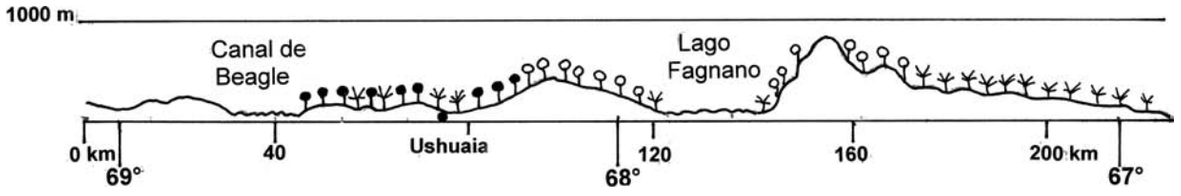


Fig. 5.3d: Cross-section across Ushuaia and Lake Fagnano

Nothofagus alpina y/o N. obliqua

N. antarctica

N. dombeyi, en el sur N. betuloides

N. pumilio

N. pumilio, achaparrado (stunted, shrubby)

Aextoxicon punctatum

Eucryphia cordifolia

Laureliopsis philippiana

Araucaria araucana

Austrocedrus chilensis

Fitzroya cupressoides

Pilgerodendron uviferum

Podocarpus nubigenus

Saxegothaea conspicua

Vegetación altoandina (unspecified Andean vegetation)

Estepa graminosa (steppe, mainly with grasses)

Estepa arbustiva-espinosa (steppe, with grasses and thorny shrubs)

Zona de transición (area of transition)

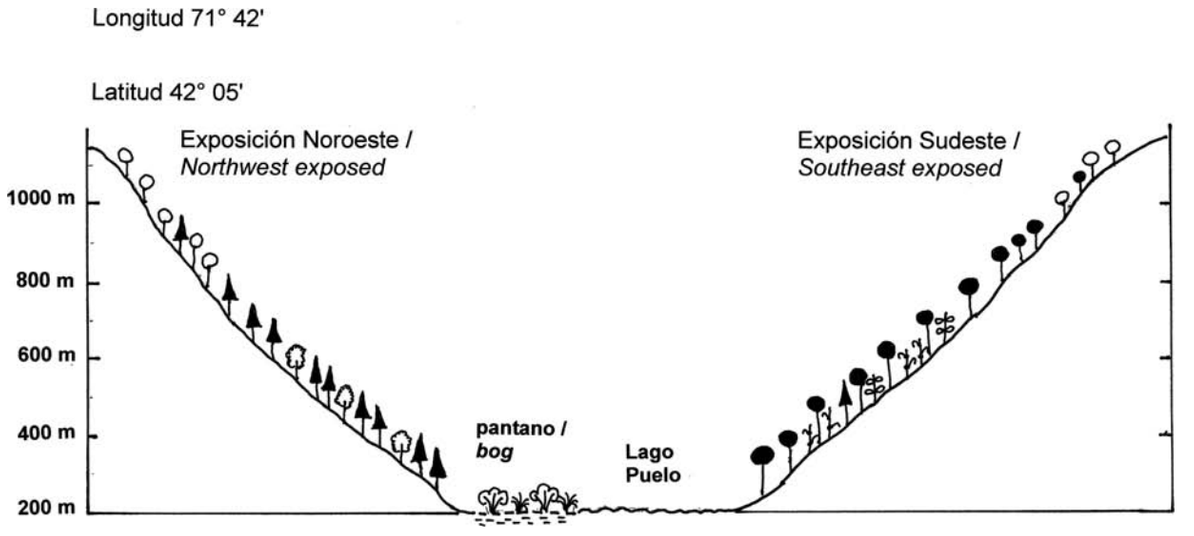


Fig. 5.3e: Cross-section from NW –SE, Lake Puelo (42° 05' S; 71° 42' W)

6. What is a tree?

In this book, I *roughly* hold to the following definition of the term **'tree'**: A **tree** is a woody plant with *one* main erect perennial stem reaching at least 3 m of height and giving rise to a crown of a well definable, characteristic shape.

A **shrub**, on the other hand, is a woody plant, usually less than 5 m tall, which has several stems, none dominant, from the base upwards.

Certain species may comply with these conditions only occasionally, adopting at several locations and times the features of a shrub (e.g. *Nothofagus pumilio, Colletia hystrix*). The change of their appearances may depend on internal factors as well as on conditions of the environment, but it is not always easy to determine which of these components is crucial.

I also include a few species that generally grow as shrubs and only now and then develop a tree-like appearance (e.g. *Desfontainia spinosa, Rosa rubiginosa, Tamarix gallica*), as well as an *Agavaceae* (*Cordyline australis*) and a *Poaceae* (*Chusquea culeou*), eye-catching plants which resemble trees (in the narrower sense of the term) to a certain extent, but are not considered to be trees in a very strict sense of the term.

7. Flowering plants and their divisions

All the species considered in this guide are **Spermatophyta** (*seed plants* or *flowering plants,* in a broader sense), and we distinguish two major sections: **Gymnospermae** and **Angiospermatopsida.**

– **'Gymnospermae'** literally means "naked seeds", a term referring to the fact that in these plants the ovules (and subsequently the seeds) are – in principle – borne openly on the megasporophylls. According to most botanists, the group of the gymnosperms comprises species belonging to four different phyla: *Cycadopsida, Ginkgopsida, Coniferopsida,* and *Gnetopsida.* As far as the scope of our book is concerned, we shall mainly deal with one of these phyla: ***Coniferopsida***. In other words: For our purposes, gymnosperms are conifers, i.e. plants the seeds of which are borne in cones – allowing for the exception of *Ginkgo biloba,* the only extant species of the *Ginkgopsida,* the characters of which will be described with the species.
– **'Angiospermatopsida'** or **'Angiosperms'** means "seeds in a vessel", referring to the fact that the ovules are borne inside a megasporophyll, called *carpel,* which envelopes and carries them in its inferior part, the *ovary.* After fertilization, the ovules develop into seeds and the ovary becomes a *fruit*. Most scientists look upon *conifers* and *angiosperms* as *phyla* belonging to equivalent hierarchical levels within the all-encompassing group of the Spermatophyta.

I shall now proceed to characterize *conifers* (chapter **8**) and *angiosperms* (chapter **9**), and then step on to subdivide the angiosperms in *dicots* and *monocots* (chapter **10**). In a third step (chapter **11**), I shall then separate the entire set of species included in our manual into 25 *main groups* and several *subgroups.*

Whereas the distinction between gymnosperms and angiosperms, and the subdivision of the latter ones into dicots and monocots is deeply rooted and of fundamental scientific importance, the separation – in chapter **11** – of the species into 25 *main groups* and several *subgroups*, should merely be taken as an expedient for the identification of the genera and species dealt with in the guide. This is so because in the keys I rely almost entirely on easily accessible vegetative characters; thereby largely skipping over the delicate reproductive features which, although highly characteristic and often very showy, usually appear only during a comparatively short period of the year. Nevertheless, since the reproductive features are essential for understanding the morphological structure of the flowers and fruits, determining the phylogenetic roots of a species, and establishing its taxonomic place within the plant kingdom, some basic information about flowers and fruits is provided with the description of each species.

As already stated, the *detailed descriptions and illustrations* of the species follow in the chapters **12 (gymnosperms [conifers], 13 (dicots)**, and **14 (monocots),** where the genera (and subsequently their species) are presented alphabetically.

8. Characteristic features of gymnosperms (conifers)

8.1. Perennial and deciduous leaves – leaf shapes

Most conifers are evergreen, have *perennial* leaves, i.e. their leaves stay on the shoots 3-8 years. Some conifers, however, have *deciduous* leaves, lasting only one season (e.g. *Larix* sp.) The leaves are always simple, either narrow, linear or needle-like, or very small, scale-like. Several types of leaves may develop on different places of the same branch. We shall distinguish between six basic *leaf shapes of conifers:* a) needle-like; b) linear, c) linear-lanceolate, d) falcate, e) flabellate, f) scale-like**.**

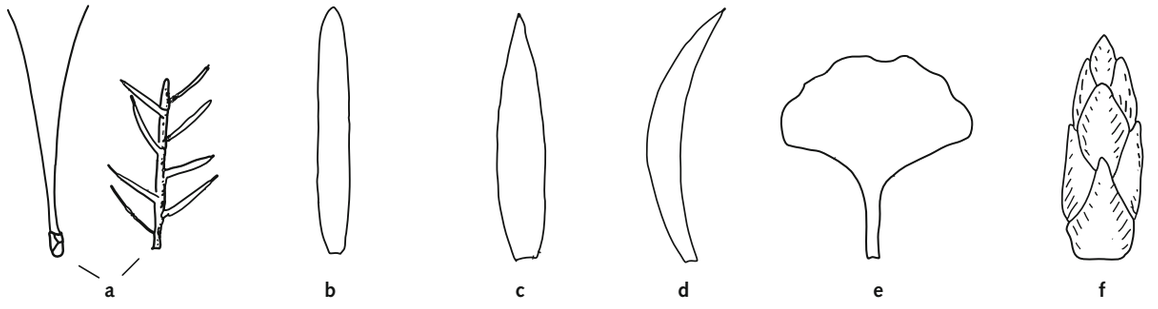


Fig. 8.1: Leaf shapes of conifers: **a:** needle-like; **b:** linear; **c:** linear-lanceolate; **d:** falcate; **e:** flabellate; **f:** scale-like

8.2. Shoots and leaf arrangement

The leaves of conifers can issue from a *long shoot* in several ways and appear in six basic types of *leaf arrangement:* a) alternate, b) distichous, c) opposite, d) verticillate (in whorls), e) imbricate (overlapping), f) in bundles of 2-30 *on short shoots* (eventually growing from secondary axes**).**

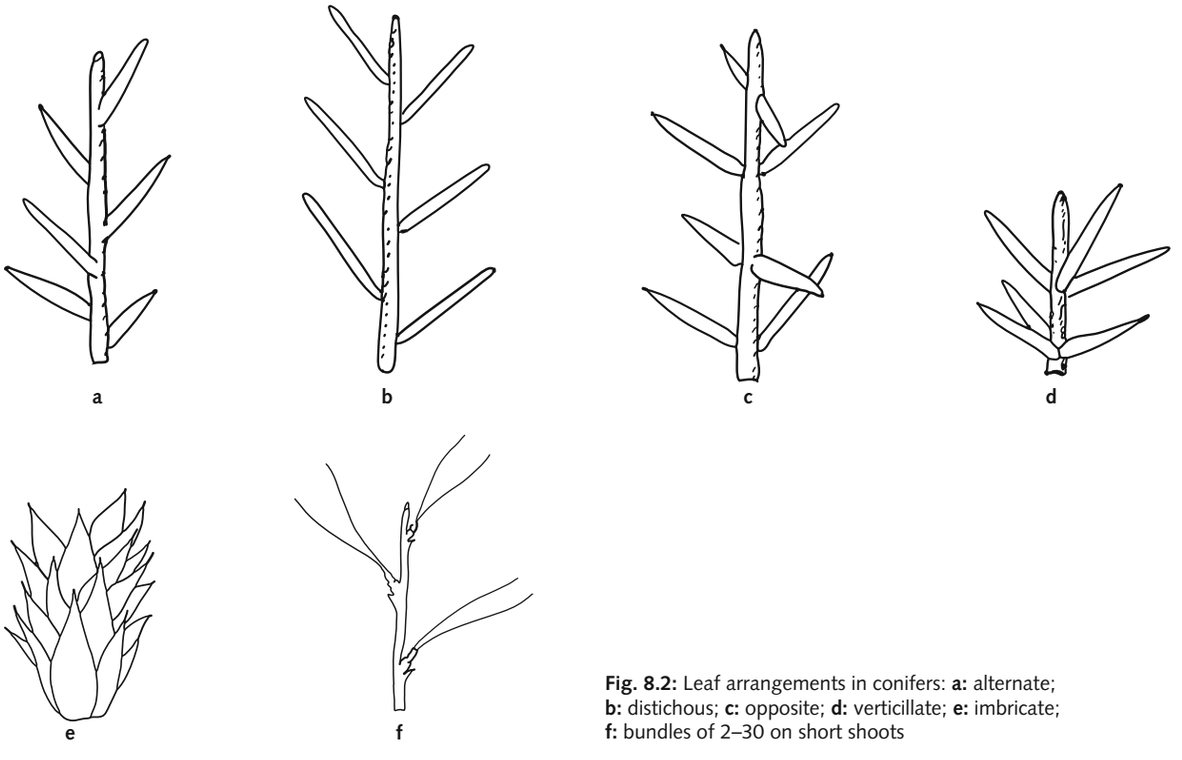


Fig. 8.2: Leaf arrangements in conifers: **a:** alternate; **b:** distichous; **c:** opposite; **d:** verticillate; **e:** imbricate; **f:** bundles of 2–30 on short shoots

8.3. Flowers and inflorescences

Conifer flowers are male or female; they are either borne on the same plant (monoecious species, e.g. *Pinus* sp.) or on different plants (dioecious species, e.g. *Taxus* sp.).

The typical form of a male flower is a simple cone (homologous to a spur shoot), consisting of an axis and microsporophylls. Thus, *a male cone is a flower*

Female flowers, however, consist of a megasporophyll (seed scale or ovuliferous scale) and an additional bract-scale which usually fuse to a seed-scale complex. These female flowers are assembled in a compound cone. Thus, *a female cone is an inflorescence,* i.e. a structure composed of several flowers. (*Taxaceae*, however, do *not* have these types of *female* cones, although they do develop the above mentioned typical *male* cones.)

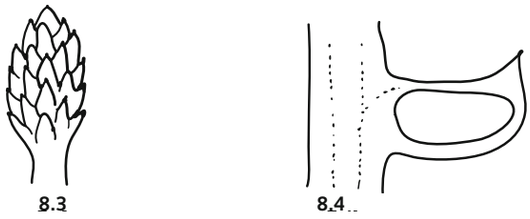


Fig. 8.3: Male cone
Fig. 8.4: Microsporophyll; longitudinal section

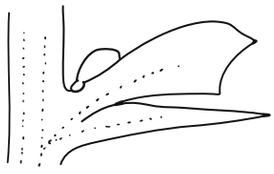


Fig. 8.5: Ovule on megasporophyll (seed-scale); underneath: bract-scale

8.4. Pollination and fertilization

Conifers are *anemophilous* (wind-pollinated). After the pollination of the ovule, the *egg cell* alone is fertilized by a sperm cell: hence, conifers have a *simple fertilization*.

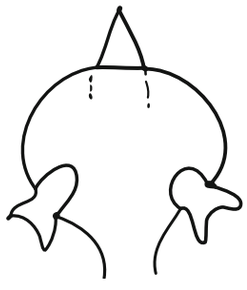


Fig. 8.6: 2 ovules on seed-scale; on top: apex of bract-scale

8.5. Mature seeds and cones

After fertilization, the ovules of the conifers develop into mature seeds inside the growing female cone which finally opens and releases the seeds. In certain species, either the megasporophylls develop into fleshy scales around the seeds (e.g. *Juniperus* sp.) or the basis of the ovule turns into a fleshy arillus which partly envelopes the seed (e.g. *Taxus* sp.).

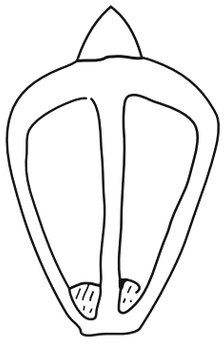


Fig. 8.7: Seed-scale with 2 seeds, from above; on top: apex of bract-scale

8.6. Genera of gymnosperms described in this book

Abies (Pinaceae)
Araucaria (Araucariaceae)
Austrocedrus (Cupressaceae)
Calocedrus (Cupressaceae)
Cedrus (Pinaceae)
Chamaecyparis (Cupressaceae)
Cryptomeria (Taxodiaceae)
Cupressus (Cupressaceae)
Fitzroya (Cupressaceae)
Ginkgo (Ginkgoaceae)
Juniperus (Cupressaceae)
Larix (Pinaceae)
Metasequoia (Taxodiaceae)
Picea (Pinaceae)
Pilgerodendron (Cupressaceae)
Pinus (Pinaceae)
Podocarpus (Podocarpaceae)
Pseudotsuga (Pinaceae)
Saxegothaea (Podocarpaceae)
Sequoia (Taxodiaceae)
Sequoiadendron (Taxodiaceae)
Taxodium (Taxodiaceae)
Taxus (Taxaceae)
Thuja (Cupressaceae)

9. Characteristic features of angiosperms

9.1. Shoots and leaves

In angiosperms, the relations between axis and leaves, as well as the general morphological structure of a leaf, follow a basic pattern which can be represented by two diagrams:

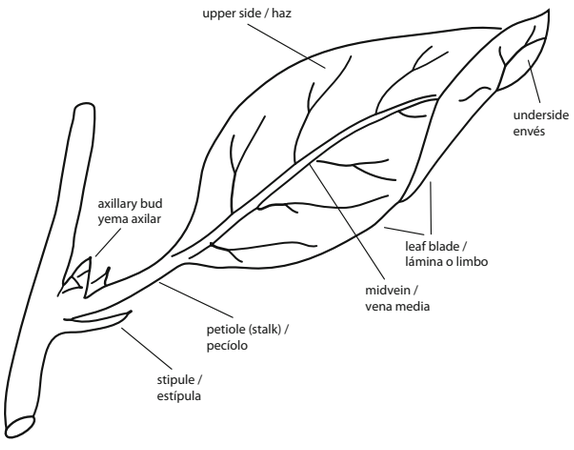


Fig. 9.1a: Parts of a simple leaf (after López González, modified).

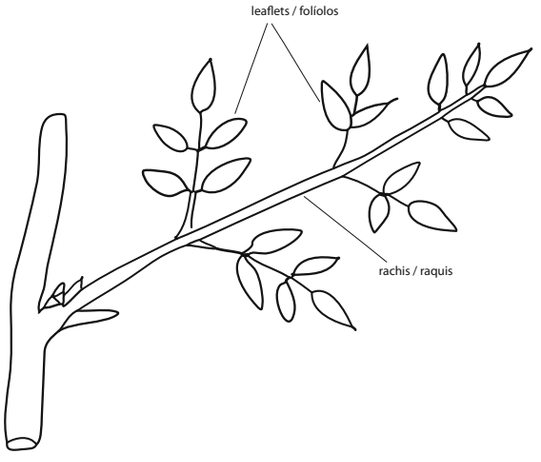


Fig. 9.1b: Parts of a compound leaf (after López González, modified).

This basic pattern of a simple and a compound leaf, respectively, allows a large number of variations in several respects. We shall consider variations in six general characters:

9.1.1. Leaf arrangement

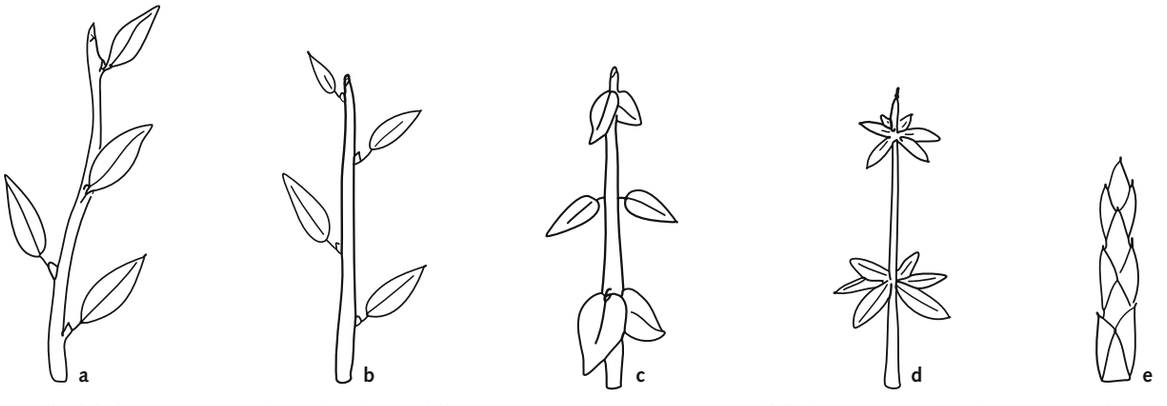


Fig. 9.2: Leaf arrangement: **a:** alternate; **b:** distichous; **c:** opposite, decussate; **d:** verticillate, whorled; **e:** imbricate, overlapping

9.1.2. Shapes of a simple leaf blade

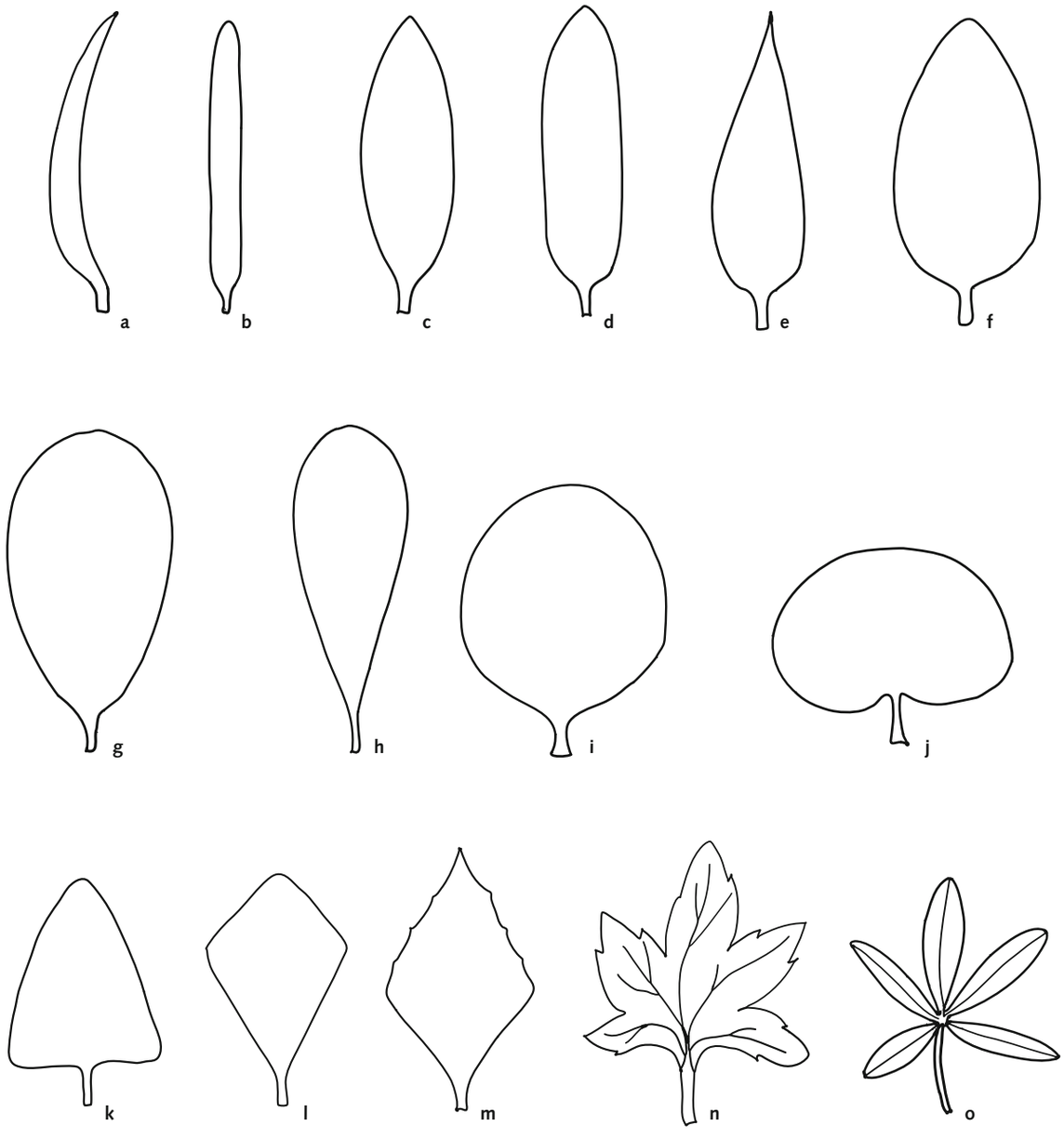


Fig. 9.3: Shapes of a simple leaf blade: **a:** falcate; **b:** linear; **c:** elliptic; **d:** oblong; **e:** lanceolate; **f:** ovate; **g:** obovate; **h:** oblanceolate; **i:** orbicular; **j:** reniform, kidney-shaped; **k:** triangular; **l:** rhombic; **m:** square; **n:** palmatifid, palmately lobed; **o:** palmatisect, palmately divided

9.1.3. Shapes of the leaf apex

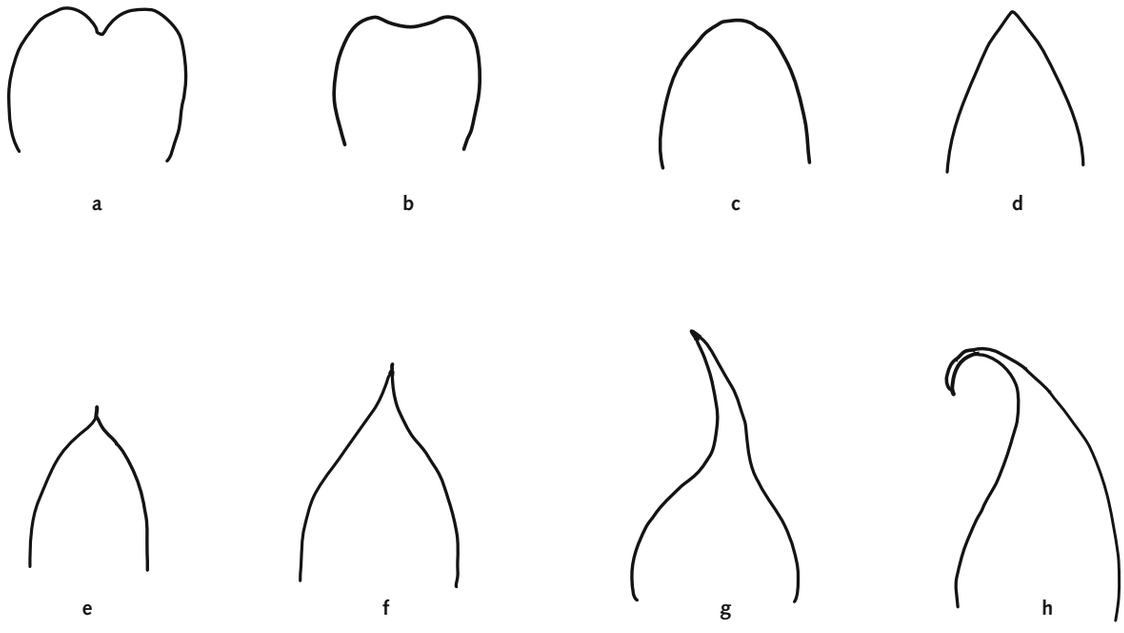


Fig. 9.4: Shapes of the leaf apex: **a:** obcordate; **b:** emarginate; **c:** obtuse, rounded; **d:** acute, pointed; **e:** mucronate; **f:** acuminate, tapering; **g:** caudate, tail-like; **h:** cirrose, with a tendril

9.1.4. Shapes of the leaf base

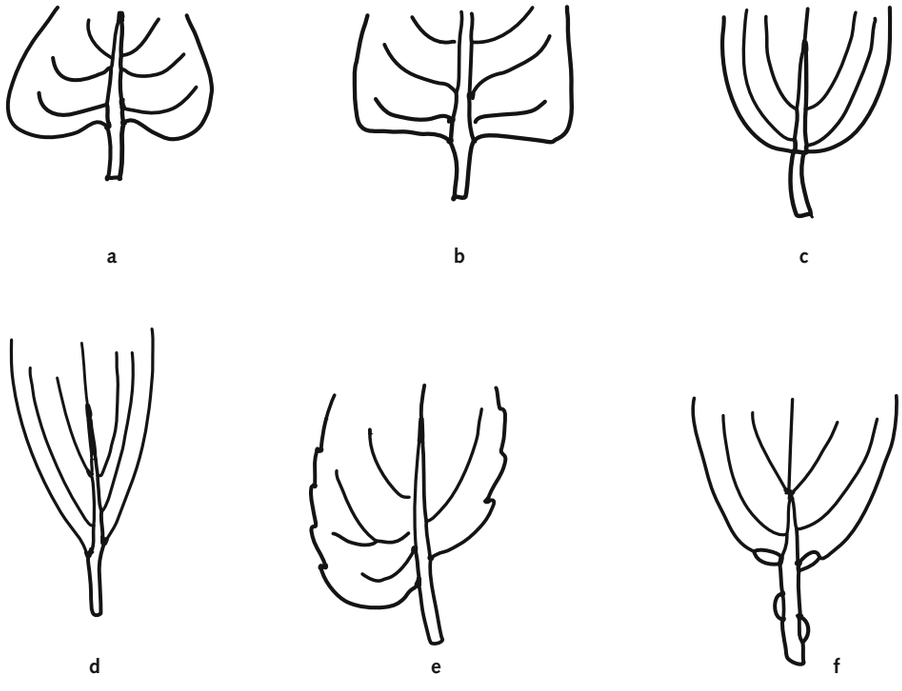


Fig. 9.5: Shapes of the leaf base: **a:** cordate, heart-shaped; **b:** truncate; **c:** rounded; **d:** cuneate, wedge-shaped; **e:** oblique, asymmetric; **f:** with glands

9.1.5. Patterns of the leaf margin

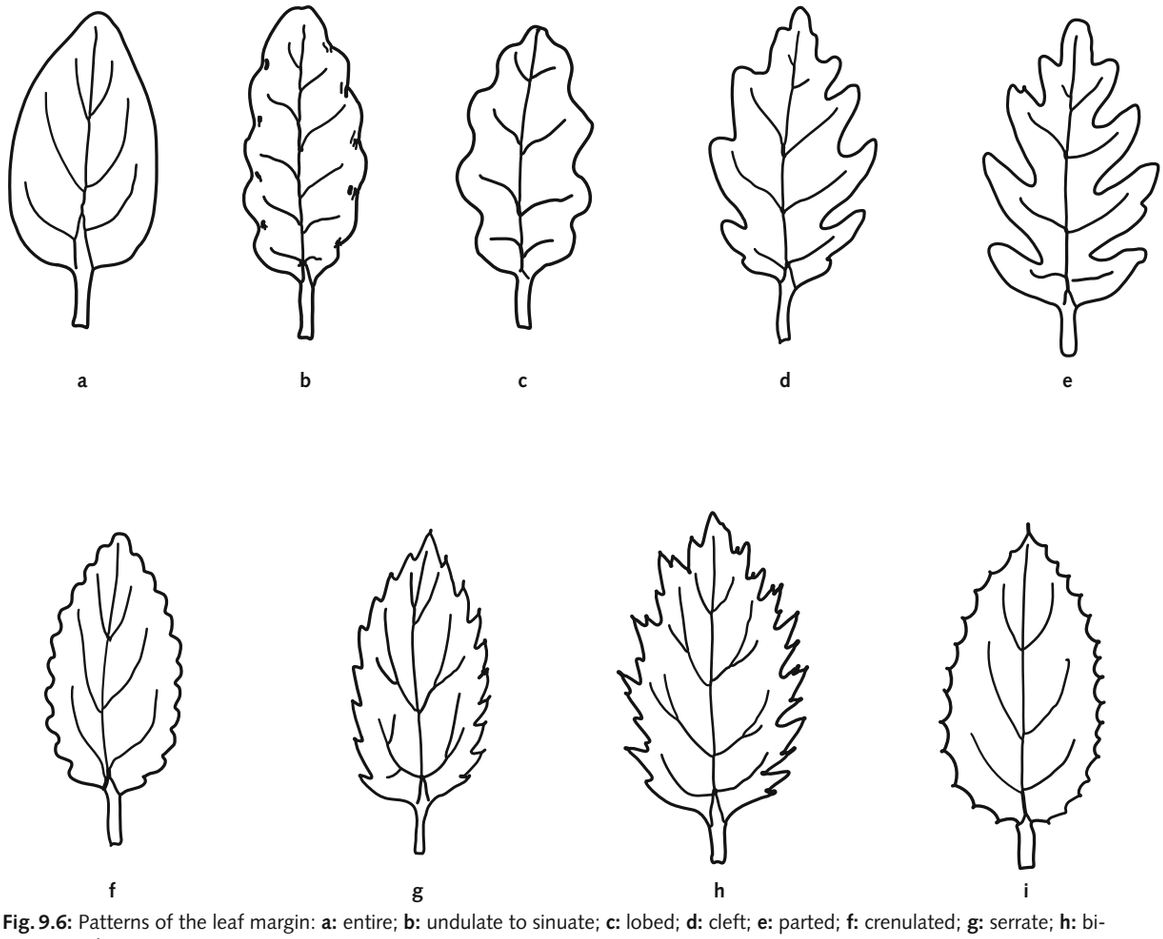


Fig. 9.6: Patterns of the leaf margin: **a:** entire; **b:** undulate to sinuate; **c:** lobed; **d:** cleft; **e:** parted; **f:** crenulated; **g:** serrate; **h:** bi-serrate; **i:** dentate

9.1.6. Types of a compound leaf

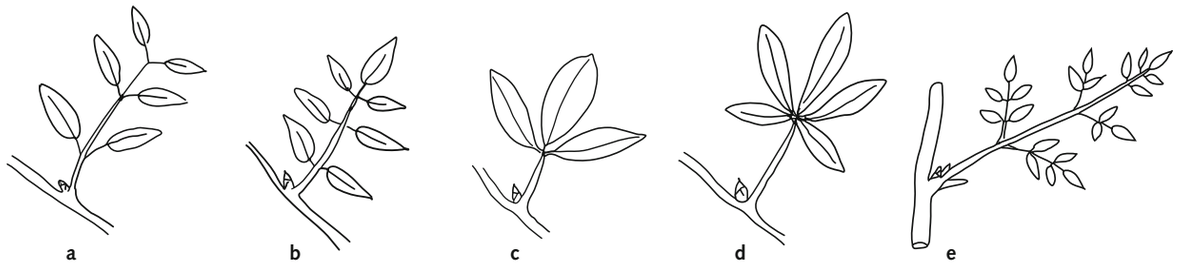


Fig. 9.7: *Types of a compound leaf*: **a:** even-pinnate; **b:** odd-pinnate; **c:** trifoliate; **d:** palmatisect; **e:** bi-pinnate

9.2. Flowers and inflorescences

Angiosperm flowers are usually bisexual, although several broadleaves among the forest trees have unisexual flowers (e.g. *Nothofagus* sp., *Quercus* sp.). A typical, fully developed angiosperm flower consists of the following organs:

- An axis (*receptacle*) bearing four whorls of specialized, modified leaves:
- *sepals* (the *calyx*, collectively);
- *petals* (the *corolla*, collectively);
- *stamens* (the microsporophylls, forming the *androecium*, collectively);
- *carpels* (the megasporophylls, forming the *gynoecium*, collectively).

Calyx and corolla together constitute the *perianth*. The petals, and sometimes also the sepals, are often delicately coloured. Between petals and stamens, nectar-glands are common, and the entire flower is often fragrant.

The stamens produce pollen grains (microspores).

The carpels can be either free or connate, i.e. unite and form a single, complex organ, called *pistil*. In principle, each carpel subdivides itself into an *ovary*, carrying the *ovules*, a *style*, and a *stigma*, which receives the pollen grains.

The *ovary* is *superior* when it grows at the apex of the conical receptacle – and perianth and stamens develop below it, being in a hypogynous position; in the case of an *inferior ovary*, the receptacle completely encloses the ovary – and perianth and stamens emerge above it, in an epigynous position.

The term 'inflorescence' refers to the cluster of flowers and floral ramifications which originate from one central axis, the *peduncle*. In certain cases, the central axis bears a single, solitary flower. In most species, however, the main axis ramifies, and these first order branches often ramify in their turn, leading to very complex structures. In our guide we distinguish the following *inflorescence forms*: **a:** raceme; **b:** panicle; **c:** umbel; **d:** thyrse; **e:** spike; **f:** capitulum (head); **g:** dichasium; **h:** cyme (helicoid cyme); **i:** corymb; **j:** ament (catkin).

9.3. Pollination and fertilization

Angiosperms are either *anemophilous*, i.e. wind-pollinated (e.g. *Nothofagus* sp.) or *zoophilous*, i.e. animal-pollinated, thereby generally being *entomophilous*, i.e. insect-pollinated (e.g. *Prunus* sp.).

Angiosperms undergo a *double fertilization*: one sperm cell (nucleus) of the pollen grain fuses with the nucleus of the egg cell of the ovule initiating the development of the future *embryo*; the other sperm cell unites with the two nuclei of the embryo sac – a process leading to the formation of the triploid endosperm of the seed.

9.4. Mature seeds and fruits

After the double fertilization, the ovules develop into mature *seeds* inside the ovary which, in its turn, becomes a *fruit* in the narrower meaning of the term. In a broader sense, the term 'fruit' stands for "flower (in certain cases: inflorescence) with ripe seeds". Depending on the organs which are included in the formation of a fruit (in the wider sense), we speak of *simple, aggregate, multiple* fruits, and *pomes.*

As regards *simple fruits*, which develop from one carpel or from several united carpels, we distinguish between dehiscent and indehiscent fruits. In *dehiscent fruits*, the ripe ovary breaks open, freeing the seeds; whereas in *indehiscent fruits*, the ovary still encloses the seeds after the fruit has been shed from the mother plant. In our book, we distinguish two types of *dehiscent* fruits: legumes and

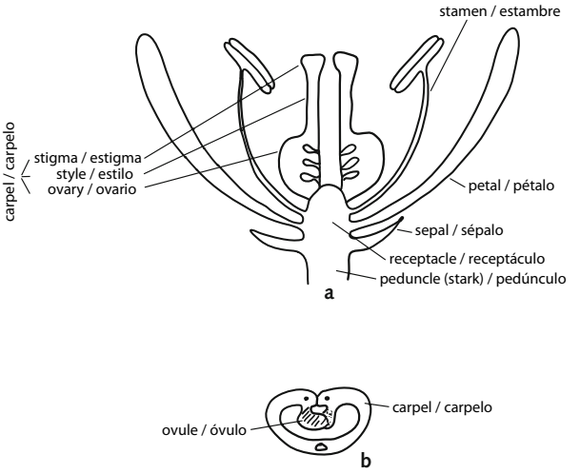


Fig. 9.8: a: Floral organs of an angiosperm flower.; **b:** Cross-section through an ovary of one carpel, showing the ovules

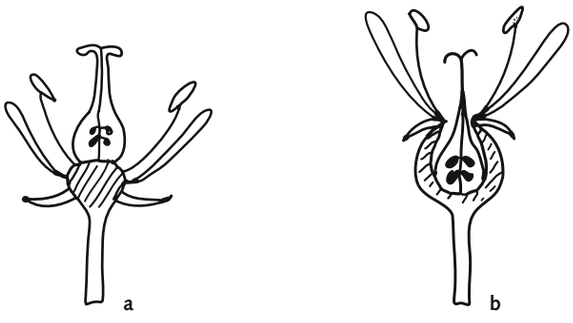


Fig. 9.9: a: Superior ovary; **b:** Inferior ovary

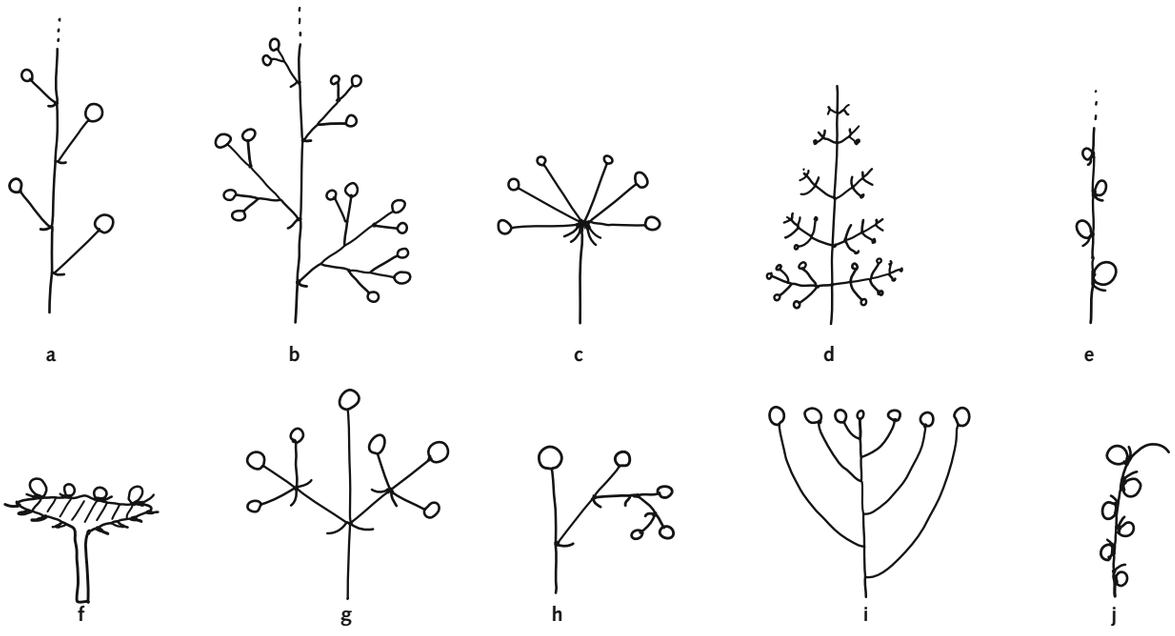


Fig. 9.10: Inflorescences: **a:** raceme; **b:** panicle; **c:** umbel; **d:** thyrse; **e:** spike; **f:** capitulum, head; **g:** dichasium; **h:** cyme (helicoid cyme); **i:** corymb; **j:** ament, catkin

capsules – and three basic types of *indehiscent* fruits: berries, drupes, and nuts.

In the case of *aggregate fruits*, several separate carpels of one gynoecium develop into small simple fruitlets which remain together, thus giving rise to a fruit of a higher order.

Multiple fruits are even more complicated, since they develop from inflorescences and consist of the gynoecia of several flowers. It is usually the tissue of the peduncle of the inflorescence which turns into the fleshy parts of the multiple fruits.

In a *pome*, finally, it is the receptacle of a single flower with separate, inferior ovaries which grows into the fleshy tissue.

Figure 9.11 shows the structures of most of the fruit types referred to in the descriptions of the species.

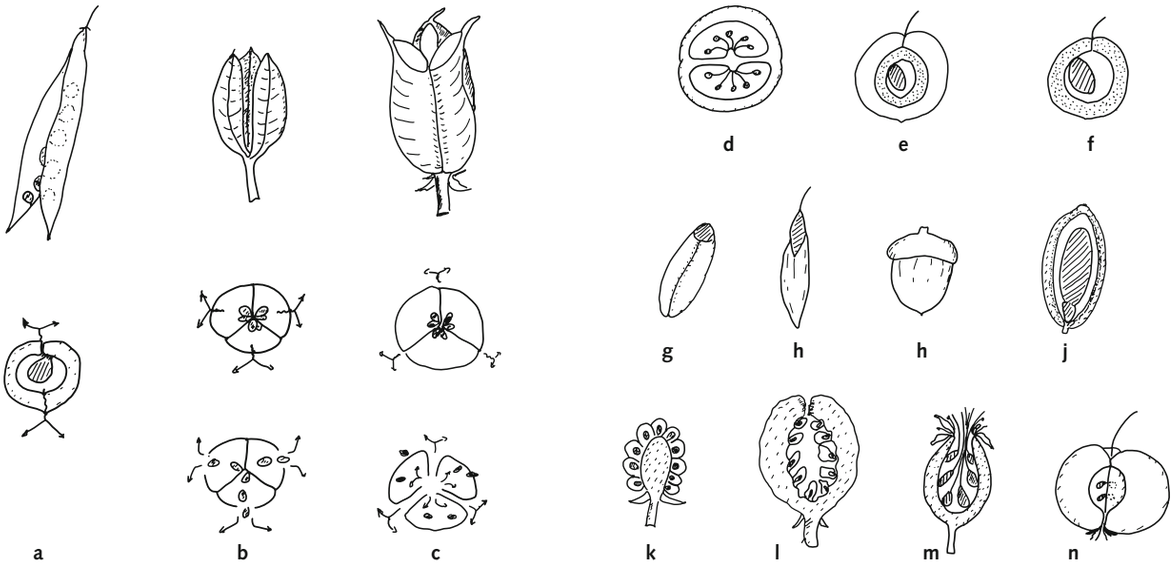


Fig. 9.11: Fruits: **a:** legume, pod; **b:** loculicide capsule; **c:** septicide capsule ; **d:** berry; **e:** drupe; **f:** nut; **g:** caryopsis; **h:** samara; **i:** acorn; **j:** achene; **k:** aggregate with drupelets; **l:** syconium; **m:** hip; **n:** pome. See also **Chapter 20: Glossary**

10. Dicots and monocots

Angiosperms are currently divided into two major classes: *Dicotyledones* (dicots), with about 165,000 species, and *Monocotyledones* (monocots), with approximately 65,000 species. The *main* differences between plants belonging to one or the other of these classes are summarized in the following table and illustrated in Fig. 10.

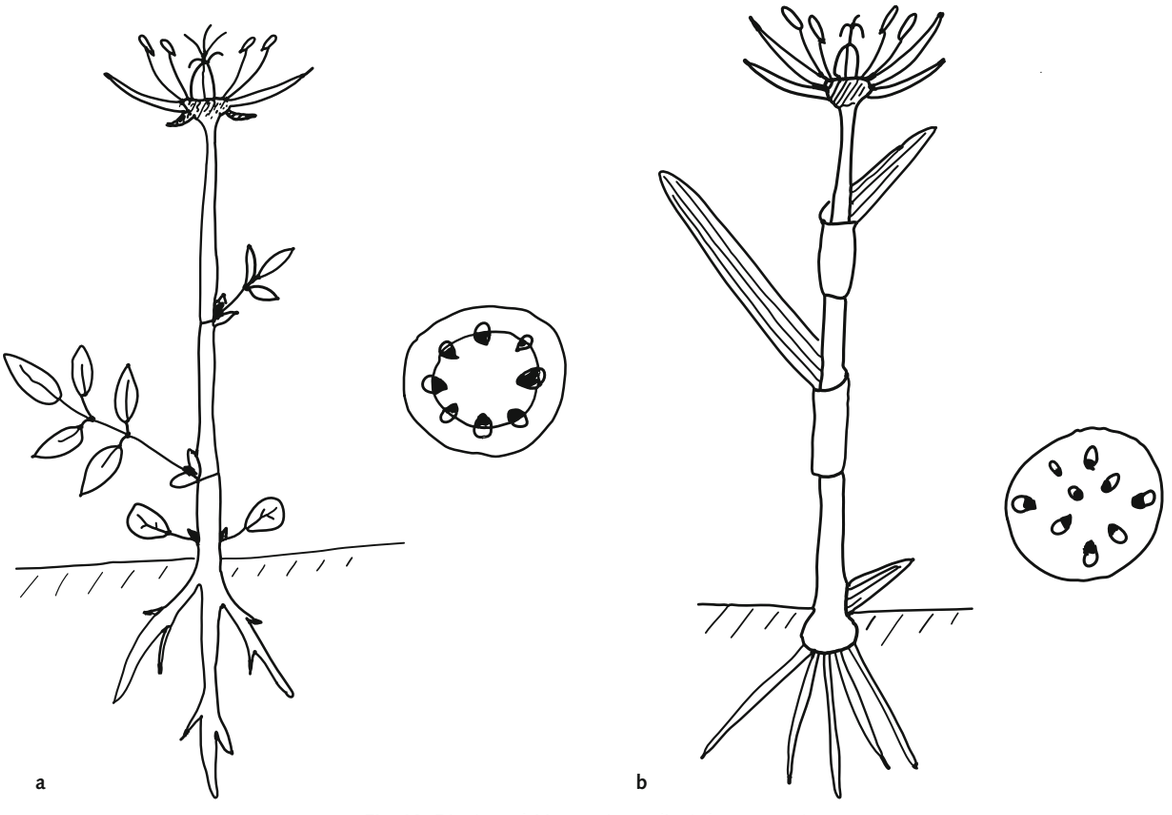


Fig. 10: Dicots and Monocots: **a:** dicot; **b:** monocot

10.1. Main differences between Dicotyledones and Monocotyledones

Character	*Dicots*	*Monocots*
Cotyledons	two	one
Shape of leaves	simple or compound – a large variety of types of blades, leaf margins, leaf bases, and leaf apices	usually simple, linear to lanceolate (in palms, fan-like or large pinnate)
Venation of leaves	usually netlike	usually parallel
Flowers	sepals and petals often different, and in whorls of fours or fives	sepals and petals often alike, and in whorls of threes
True secondary growth, having a vascular cambium	commonly present	very rare

For our book, the last one of the listed characters is crucial: As monocots lack a vascular cambium in stem and root, they do not develop a true secondary growth of the stem and cannot form "ordinary" trees. There are, however, a few *apparent* exceptions to this rule: *Palms* (e.g. *Trachycarpus* sp.) are tree-like, generally having a single, un-branched stem that does not increase in girth with age and which is topped by a crown consisting of a cluster of single, large pinnate or fan-like leaves; *bamboos* (e.g. *Chusquea* sp.) may reach several metres of height and form a dense forest-like structure; certain Agavaceae (e.g. *Cordyline* sp.) can also appear in a tree-like habit, the plants being scarcely branched, and each branch ending in a cluster of long, simple leaves. Apart from these, and *Ginkgo biloba,* all trees in Patagonia belong either to the conifers or to the dicots.

10.2. Genera of dicots described in this book

Acacia (Fabaceae [Mimosaceae])
Acer (Aceraceae)
Aesculus (Hippocastanaceae)
Aextoxicon (Aextoxicaceae)
Ailanthus (Simaroubaceae)
Albizia (Fabaceae [Mimosaceae])
Alnus (Betulaceae)
Amomyrtus (Myrtaceae)
Aristotelia (Elaeocarpaceae)
Azara (Flacourtiaceae)
Betula (Betulaceae)
Buddleja (Buddlejaceae)
Caldcluvia (Cunoniaceae)
Camellia (Theaceae)
Castanea (Fagaceae)
Casuarina (Casuarinaceae)
Catalpa (Bignoniaceae)
Cercis (Fabaceae [Caesalpiniaceae])
Colletia (Rhamnaceae)
Cryptocarya (Lauraceae)
Crataegus (Rosaceae)
Cydonia (Rosaceae)
Cytisus (Fabaceae)
Dasyphyllum (Asteraceae)
Desfontainia (Desfontainiaceae)
Diostea (Verbenaceae)
Discaria (Rhamnaceae)
Drimys (Winteraceae)
Elaeagnus (Elaeagnaceae)
Embothrium (Proteaceae)
Erythrina (Fabaceae)
Eucalyptus (Myrtaceae)
Eucryphia (Eucryphiaceae)
Fagus (Fagaceae)
Ficus (Moraceae)
Fraxinus (Oleaceae)
Gevuina (Proteaceae)
Gleditsia (Fabaceae [Caesalpiniaceae])
Ilex (Aquifoliaceae)
Juglans (Juglandaceae)
Laburnum (Fabaceae)
Lagerstroemia (Lythraceae)
Laurelia (Atherospermataceae)
Laureliopsis (Atherospermataceae)
Laurus (Lauraceae)
Ligustrum (Oleaceae)
Liriodendron (Magnoliaceae)
Lomatia (Proteaceae)
Luma (Myrtaceae)
Magnolia (Magnoliaceae)
Malus (Rosaceae)
Maytenus (Celastraceae)
Melia (Meliaceae)
Misodendron (Misodendraceae)
Morus (Moraceae)
Myrceugenia (Myrtaceae)
Nicotiana (Solanaceae)
Nothofagus (Fagaceae)
Olea (Oleaceae)
Parrotia (Hamamelidaceae)
Persea (Lauraceae)
Peumus (Monimiaceae)
Phellodendron (Rutaceae)
Photinia (Rosaceae)
Platanus (Platanaceae)
Populus (Salicaceae)
Prunus (Rosaceae)
Pseudopanax (Araliaceae)
Quercus (Fagaceae)
Rhaphithamnus (Verbenaceae)
Robinia (Fabaceae)
Rosa (Rosaceae)
Salix (Salicaceae)
Sambucus (Caprifoliaceae)
Schinus (Anacardiaceae)
Sophora (Fabaceae)
Sorbus (Rosaceae)
Syringa (Oleaceae)
Tamarix (Tamaricaceae)
Tepualia (Myrtaceae)
Tilia (Tiliaceae)
Tristerix (Loranthaceae)
Ulex (Fabaceae)
Ulmus Ulmaceae)
Weinmannia (Cunoniaceae)

10.3. Genera of monocots described in this book

Chusquea (Poaceae)
Cordyline (Agavaceae)
Jubaea (Arecaceae)
Phoenix (Arecaceae)
Trachycarpus (Arecaceae)
Washingtonia (Arecaceae)
Yucca (Agavaceae)

11. Keys to groups of trees

Fig. 11.0: Remnants of the *Aextoxicon punctatum*-forest which had covered large areas of the West-exposed slopes of the Coastal Range in Chile (Curiñanco, near Valdivia, 02.10.2006). Reproduced with the kind permission of Thomas Bretscher

11.1. Key to 25 main groups of trees in Patagonia

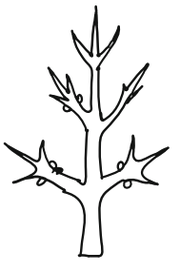
1.	– Leafless plants, very thorny and ramose	→ **G 1**
	– Leaves present, at least during the growing season	→ 2.
2.	– Palm-like structured plants *or* plants with a large, not branched grass-culm (as stem), with prominent joints	→ **G 2**
	– *Neither* palm-like structured plants *nor* plants with a grass-culm	→ 3.
3.	– Older –second year– shoots with scale-like leaves < 1 cm	→ **G 3**
	– Leaves *not* scale-like, usually > 1 cm	→ 4.
4.	– Overlapping oval-lanceolate, lanceolate, linear *or* slightly falcate leaves; > 1 cm, at least on young long shoots	→ **G 4**
	– Leaves *not* overlapping	→ 5.
5.	– Spreading *single* needle-like *or* linear to falcate leaves; > 1 cm, at least on young long shoots	→ **G 5**
	– *Either* bundles of 2–30 needle-like leaves *or* larger, broader leaves	→ 6.
6.	– Bundles of 2–5 needle-like leaves, these > 2.4 cm; leaves only on spur shoots	→ **G 6**
	– *Either* bundles of 6–30 needle-like leaves on spur shoots *or* leaves broader	→ 7.
7.	– Bundles of 6–30 needle-like leaves on spur shoots; *single* needle-like leaves on young long shoots	→ **G 7**
	– Leaves broader, not needle-like	→ 8.
8.	– **Alternate** leaves	→ 9.
	– **Opposite** leaves (occasionally whorled, e.g. in *Lagerstroemia*)	→ 21.
9.	– Palmati*sect* (digitate) *or* palmati*fid* (palmately lobed) leaf blade	→ 10.
	– Leaf blade neither palmatisect nor palmatifid	→ 11.
10.	– Palmati*sect* (digitate) leaf blade	→ **G 8**
	– Palmati*fid* (palmately lobed) leaf blade	→ **G 9**
11.	– Two types of leaves in pairs on the same twig: the *larger* one obovate to rounded or elliptic-lanceolate and dentate; the *smaller* one rounded	→ **G 10**
	– Only one type of leaf on the same twig	→ 12.
12.	– *Odd*-pinnate, *even*-pinnate, *bi*-pinnate or *tri*-pinnate leaves	→ **G 11**
	– Trifoliate leaves *or* simple leaves	→ 13.
13.	– Trifoliate leaves	→ **G 12**
	– Leaves *simple* (alternate)	→ 14.
14.	– Dark purple, almost black leaves	→ **G 13**
	– Leaves mainly green or whitish, sometimes tinged or blotted with purple	→ 15.
15.	– *Glands* on petiole or/and on margin of base of leaf blade	→ **G 14**
	– No glands, *neither* on petiole *nor* on margin of base of leaf blade	→ 16.
16.	– *Lobed* to *cleft* or *parted* leaf blades	→ **G 15**
	– Leaf blade neither lobed nor cleft nor parted	→ 17.

17.	– *Asymmetric base* of leaf blade	→ **G 16**
	– Symmetric leaf blade *or* asymmetric ± cordate leaf blade *or* leaf blade falcate	→ 18.
18.	– *Asymmetric* ± cordate leaf blade (*not* falcate)	→ **G 17**
	– *Largely* symmetric leaf blade or leaf blade falcate	→ 19.
19.	– *Symmetric* cordate to deltoid *or* square to rhombic leaf blade	→ **G 18**
	– Leaf blade *neither* cordate to deltoid *nor* quadrate to rhombic	→ 20.
20.	– *Clearly* dentate, serrate or bi-serrate leaf margin	→ **G 19**
	– Crenate to *finely* serrate leaf margin	→ **G 20**
	– Entire to undulate leaf margin	→ **G 21**
21.	– (**Leaves opposite**) *Odd*-pinnate, *bi*-pinnate or *tri*foliate leaves	→ **G 22**
	– Leaves simple	→ 22.
22.	– Tapering (long acuminate) leaf apex *and* leaf underside yellowish or white-tomentose	→ **G 23**
	– Leaf apex *either* not tapering *or*: if tapering, the leaf underside *not* yellowish or white-tomentose	→ 23.
23.	– Crenate, dentate, serrate or bi-serrate leaf margins	→ **G 24**
	– Undulate (sinuate) *or* entire leaf margin *or* margin entire with two small lobes	→ **G 25**

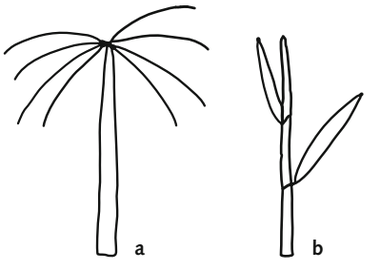
11.2. Characterisation and subdivision of the main groups of trees

Remark: *Leaves are* ***simple*** *if not otherwise specified.*

G 1 *Leafless, ramose plants, very thorny* → *Colletia hystrix*, *Ulex europaeus*



G 2 Palm-like structured plants (a) **or** plants with a large, **not** branched grasculm stem with prominent joints (b)

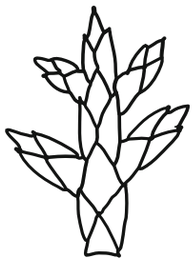


G 2.1 *Palm-like* structured plants → *Cordyline australis*
Jubaea chilensis
Phoenix canariensis
Trachycarpus fortunei
Washingtonia filifera
Yucca elephantipes

G 2.2 *Grass-culm stem,* not branched, with prominent joints → *Chusquea culeou*

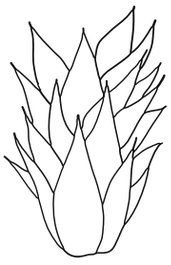
G 3 **Scale-like** leaves **on old** shoots, < 1 cm; **conifers;** see also *Tamarix* and *Casuarina*

G 3.1 **Flattened** sprays (foliage in **one** plane); **conifers** → *Austrocedrus chilensis*
Calocedrus decurrens
Chamaecyparis lawsoniana
Thuja occidentalis
Thuja orientalis
Thuja plicata

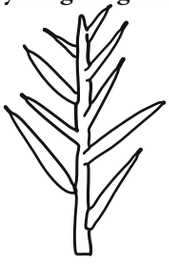


G 3.2 **Irregular** sprays (foliage in **several** planes); **conifers;** see also *Tamarix* and *Casuarina* → *Casuarina equisetifolia*
Cupressus arizonica
Cupressus lusitanica
Cupressus macrocarpa
Cupressus sempervirens
Fitzroya cupressoides
Juniperus virginiana
Pilgerodendron uviferum
Sequoia sempervirens
Sequoiadendron giganteum
Tamarix gallica
Tamarix ramossisima

G 4 **Overlapping** single oval-lanceolate, lanceolate, linear **or** slightly falcate leaves: > 1 cm, at least on **young long shoots**; **conifers** → *Araucaria araucana*, *Araucaria angustifolia*, *Araucaria bidwillii*, *Sequoia sempervirens*, *Sequoiadendron giganteum*

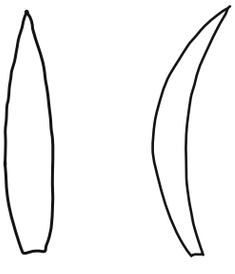


G 5 **Spreading** needle-like **or** linear to falcate leaves, usually > 1 cm, at least on **young long shoots**; **conifers**



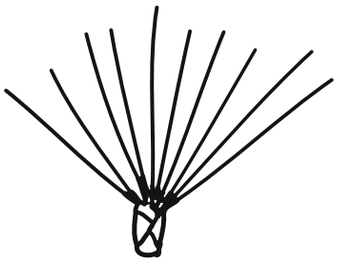
G 5.1 **Needle-like** leaves → *Cedrus atlantica*, *Cedrus deodara*, *Cedrus libani*, *Cryptomeria japonica*, *Juniperus communis*, *Larix decidua*, *Picea abies*, *Picea glauca*, *Picea pungens*

G 5.2 Leaves linear, linear-lanceolate or falcate, > 1 cm, at least on young long shoots → *Abies alba*, *Abies pinsapo*, *Juniperus communis*, *Metasequoia glyptostroboides*, *Podocarpus nubigenus*, *Podocarpus salignus*, *Pseudotsuga menziesii*, *Saxegothaea conspicua*, *Sequoia sempervirens*, *Taxus baccata*

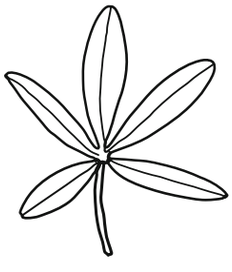


G 6 Bundles of 2–5 needle-like leaves, > 2.4 cm; leaves only on spur shoots; **conifers** → *Pinus* sp.

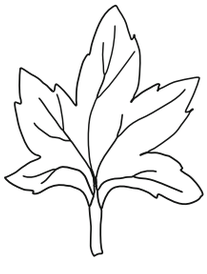
G 7 **Bundles** of 6–30 needle-like leaves, 1–4 cm, on **spur** shoots; **single** needle-leaves on young **long** shoots; **conifers** → *Cedrus atlantica*
Cedrus deodara
Cedrus libani
Larix decidua



G 8 Palmati**sect (digitate)** leaf blade → *Aesculus hippocastanum*
Aesculus parviflora
Pseudopanax laetevirens



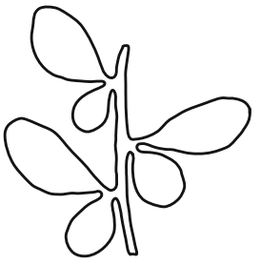
G 9 Palmati**fid (palmately lobed)** leaf blade



G 9.1 Leaves **alternate** → *Ficus carica*
Platanus X *hispanica*
Populus alba

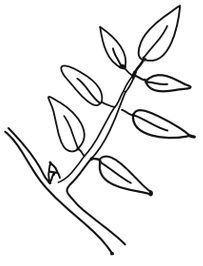
G 9.2 Leaves **opposite** → *Acer campestre*
Acer platanoides
Acer pseudoplatanus

G 10 Two types of leaves in pairs, on the same twig; the larger one obovate to rounded **or** elliptic-lanceolate and dentate; the smaller one rounded → *Azara lanceolata*
Azara microphylla

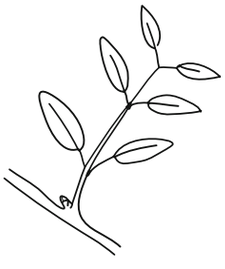


G 11 **Odd**-pinnate, **even**-pinnate **or bi**-pinnate leaves; **alternate**

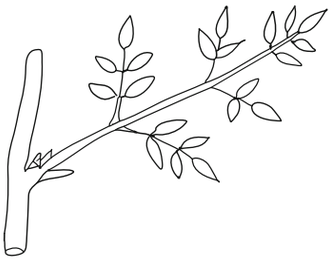
G 11.1 Odd-pinnate leaves → *Gevuina avellana*
Juglans regia
Robinia pseudoacacia
Rosa rubiginosa
Schinus areira
Sophora japonica
Sophora microphylla
Sorbus americana
Sorbus aucuparia



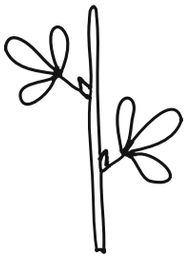
G 11.2 Even-pinnate leaves → *Ailanthus altissima*
Schinus molle



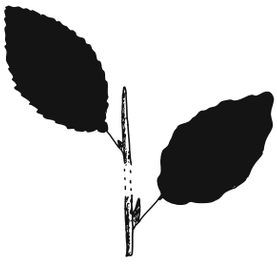
G 11.3 Bi-pinnate or **tri**-pinnate leaves → *Acacia dealbata*
Albizia julibrissin
Gevuina avellana
Gleditsia triacanthos
Melia azedarach



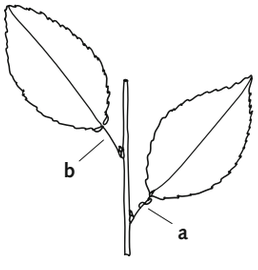
G 12 **Trifoliate** leaves; **alternate** → *Cytisus scoparius*
Erythrina crista-galli
Laburnum anagyroides



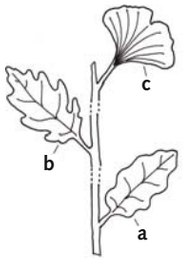
G 13 Dark purple, almost black leaves; **alternate** → *Prunus cerasifera* var. *pissardi*
Fagus sylvatica var. *purpurea*



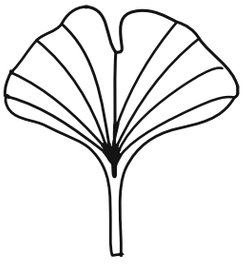
G 14 **Glands** on petiole (a) **or** (**and**) on margin of leaf base (b); leaves simple; **alternate** → *Prunus armeniaca*
Prunus avium
Prunus domestica
Prunus dulcis
Prunus padus
Prunus persica
Salix fragilis



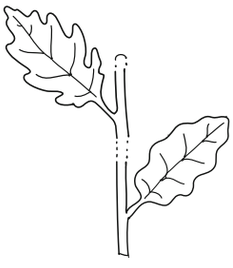
G 15 Lobed (**a**) to cleft or parted (**b, c**) leaf blades; **alternate**



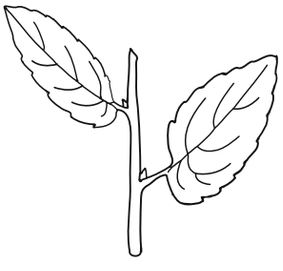
G 15.1 Fan-like leaves, apex frequently notched; venation fan-like → *Ginkgo biloba*



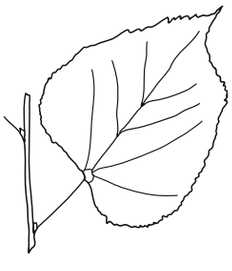
G 15.2 **Neither** leaves **nor** venation fan-like → *Crataegus laciniata*
Crataegus laevigata
Crataegus monogyna
Liriodendron tulipifera
Populus alba
Quercus palustris
Quercus robur
Quercus rubra



G 16 **Asymmetric base** of leaf blade; **alternate** → *Nothofagus antarctica*
Nothofagus obliqua
Ulmus minor
Ulmus procera

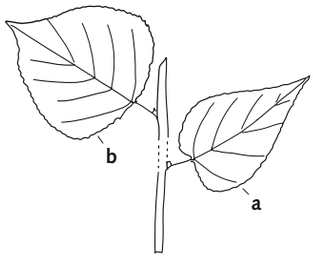


G 17 **Asymmetric** ± cordate **leaf blade** (**not** falcate); margin serrate or with blunt teeth; **alternate** → *Tilia cordata*
Tilia x *vulgaris*
Tilia platyphyllos
Morus alba

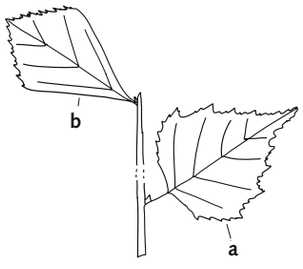


G 18 *Symmetric* cordate to deltoid *or* square to rhombic leaf blade

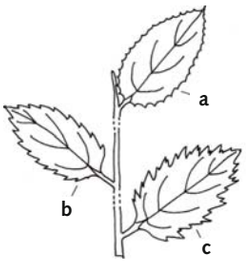
G 18.1 **Symmetric** cordate (**a**) to deltoid (**b**) **leaf blade**; **teeth hardly** prominent → *Populus nigra*
Populus trichocarpa



G 18.2 Symmetric quadrate (**a**) to rhombic (**b**) leaf blade; **teeth prominent** → *Betula pendula*
Betula pubescens



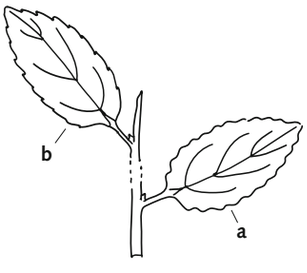
G 19 **Margin clearly** dentate (**a**), serrate (**b**) **or** bi-serrate (**c**); **alternate** → *Alnus glutinosa*
Alnus incana
Betula papyrifera
Camellia japonica
Castanea sativa
Crataegus X *Lavallei*
Ilex aquifolium
Lomatia dentata
Maytenus boaria
Nothofagus alpina
Nothofagus betuliodes
Nothofagus dombeyi
Photinia serratifolia
Prunus laurocerasus
Prunus lusitanica
Salix alba
Salix babylonica
Salix humboldtiana
Sorbus aria



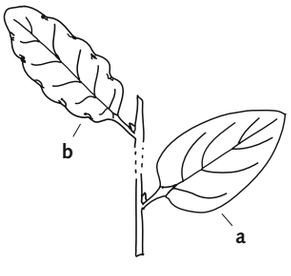
G 19.1 Leaf-blade **leathery, thick** → *Camellia japonica*
Crataegus X *Lavallei*
Ilex aquifolium
Lomatia dentata
Nothofagus betuloides
Nothofagus dombeyi
Photinia serratifolia
Prunus laurocerasus
Prunus lusitanica
Sorbus aria

G 19.2 Leaf-blade **papery** or **membranous** → *Alnus glutinosa*
Alnus incana
Betula papyrifera
Castanea sativa
Maytenus boaria
Nothofagus alpina
Salix alba
Salix babylonica
Salix humboldtiana

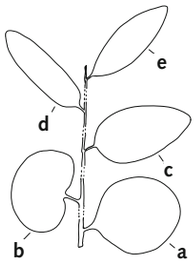
G 20 **Margin** crenate (**a**) to finely serrate (**b**); **alternate** → *Lomatia dentata*
Lomatia hirsuta
Malus domestica
Maytenus boaria
Nothofagus dombeyi
Nothofagus pumilio
Parrotia persica
Salix caprea
Schinus patagonica



G 21 **Margin** entire (**a**) to undulate (**b**); **un-**toothed leaves; **alternate**



G 21.1 Leaf **blade** orbicular (**a**) to reniform (**b**) **or** ovate (**c**) to oblong (**d**) and elliptic (**e**); **alternate**



→ *Acacia melanoxylon*
Cercis siliquastrum
Cryptocarya alba
Cydonia oblonga
Dasyphyllum diacanthoides
Drimys winteri
Embothrium coccineum
Eucalyptus sp.
Fagus sylvatica
Magnolia grandiflora
Nicotiana glauca
Persea lingue
Prunus laurocerasus
Salix caprea
Schinus patagonica

G 21.1.1 – Blades orbicular to reniform → *Cercis siliquastrum*

– Underside hairy or tomentose or ciliate and silky on the veins → *Cydonia oblonga*
Magnolia grandiflora
Persea lingue
Salix caprea
Fagus sylvatica

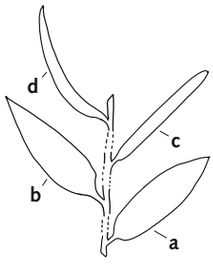
– Leaves with two spiny stipules → *Dasyphyllum diacanthoides*

– Underside bluish green or whitish → *Cryptocarya alba*
Drimys winteri
Embothrium coccineum
Eucalyptus sp.
Nicotiana glauca

– Blades ovate, 2–5.5 cm long → *Schinus patagonica*

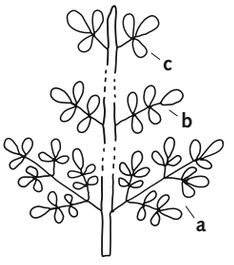
– Blades or phyllodia 5–15 cm long and 2–5 cm across → *Acacia melanoxylon*
Prunus laurocerasus

G 21.2 Leaf **blade** oblong-lanceolate (**a**)to lanceolate (**b**) **or** linear (**c**) and falcate (**d**); **alternate**

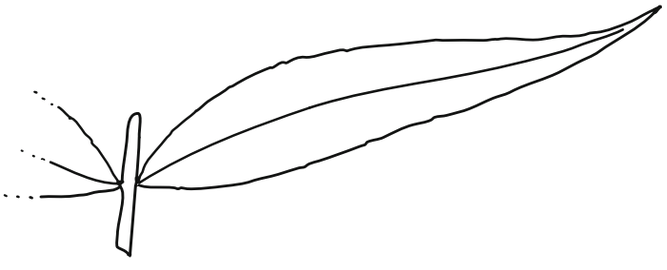


→ *Acacia melanoxylon*
Elaeagnus angustifolia
Eucalyptus sp.
Laurus nobilis
Misodendron sp.
Olea europaea
Salix fragilis

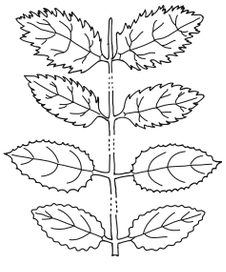
G 22 **Odd**-pinnate (**b**) **or bi**-pinnate (**a**) **or** trifoliate (**c**) leaves; **opposite** → *Acer negundo*
Fraxinus excelsior
Fraxinus pennsylvanica
Lomatia ferruginea
Phellodendron amurense
Sambucus nigra
Weinmannia trichosperma



G 23 **Tapering** leaf **apex** (long acuminate); leaf **underside** yellowish- **or** white-tomentose; **opposite** → *Buddleja davidii*
Buddleja globosa

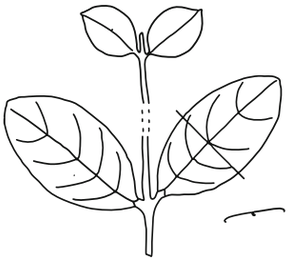


G 24 **Leaf margin** crenate, dentate, serrate **or** bi-serrate; **opposite** → *Aristotelia chilensis*
Caldcluvia paniculata
Desfontaina spinosa
Diostea juncea
Discaria trinervis
Eucryphia cordifolia
Laurelia sempervirens
Laureliopsis philippiana
Rhaphithamnus spinosa

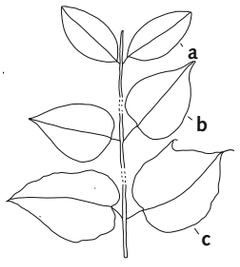


G 25 Undulate (sinuate) **or** entire leaf margin; in *Catalpa,* margin entire, but with two small lobes; **opposite**

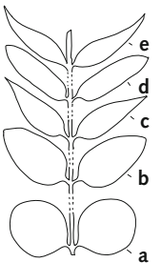
G 25.1 **Revolute** leaf margin → *Luma apiculata*
Peumus boldus



G 25.2 Leaf margin **not** revolute; leaf **blade** ovate-acuminate or pointed (**a**) to cordate-acuminate (**b**); in *Catalpa,* margin entire, but often with two small lobes (**c**) → *Catalpa bignonioides*
Ligustrum lucidum
Syringa vulgaris



G 25.3 Leaf margin **not** revolute; leaf **blade oblong-elliptic (d)** to lanceolate **(c) or** lanceolate-falcate **(e) or** ovate **(b)** to orbicular **(a)**, but **not** acuminate → *Aextoxicon punctatum*
Amomyrtus luma
Cryptocarya alba
Diostea juncea
Discaria chacaye
Discaria trinervis
Eucalyptus sp.
Lagerstroemia indica
Luma apiculata
Myrceugenia exsucca
Tepualia stipularis
Tristerix corymbosus



G 25.3.1 – Leaves from elliptical to oblong, *always* < 2.7 cm → *Diostea juncea*
Discaria chacaye
Discaria trinervis
Tepualia stipularis

– Underside ash-grey, covered with scales having red points → *Aextoxicon punctatum*

– Underside bluish-green. (In *Eucalyptus* opposite leaves only in juvenile shoots.) → *Cryptocarya alba*
Eucalyptus sp.

– Leaves ovate or orbicular, mucronate; bark silky, wine-red or orange → *Luma apiculata*

– Leaves ovate, oblong or elliptical, 1.5–7 cm → *Amomyrtus luma*
Lagerstroemia indica
Myrceugenia exsucca
Tristerix corymbosus

12. Genera and species of gymnosperms

Fig. 12.0: Islet in the Río Menéndez, PN Los Alerces. *Fitzroya cupressoides*, growing candle-like amidst *Nothofagus dombeyi* and other broad-leaves (29.01.08, afternoon)

Abies pinsapo Boissier

E: Spanish fir
Sp: Pinsapo; pino pinsapo, abeto
Fam.: Pinaceae

Fig. 12.1a,b: *Abies pinsapo* Boissier: **a:** shape, young tree **b:** shape, mature tree

Evergreen, monoecious tree, up to 25 m tall. *Bark* smooth, fissured on old trees. *Buds* ovoid, resinous. *Twigs* glabrous, brownish. *Leaves* linear and rigid, 1.5–2 cm long, acute and pungent, with one stomatic band on the *upper side* and two on the *underside*, arranged densely and in almost perpendicular radii around the shoot, conveying it a cylindrical appearance, somewhat more densely above. *Male cones* axillary, in groups. Female cone upright, 8–12 cm long, seed scales and bracts eventually falling off the cone axis which remains for long on the branch; *seeds* winged. – Fl. 9–10. Fr. (ripe cones) 4–6.

Status and distribution: Introduced; native to southern Spain and Morocco.

Habitat: Stony mountain slopes, between 1000–2000 m; always on limestone. In Patagonia, mainly in public places and gardens.

Hardiness: –20° C.

Remark: Abies is a genus of over 40 species, distributed through the temperate zones of the northern hemisphere. Dimitri (1982) lists 12 species of *Abies* for Argentine Patagonia. At present, they are mainly ornamental.

Fig. 12.1c,d: *Abies pinsapo* **Boissier: c:** needle (after Dimitri (1982), fig. 18, modified; draughtsman: C. Colarich; with the permission of the INTA.); **d:** bark

Fig. 12.1e: *Abies pinsapo* Boissier: twig

Uses:

a. Wood: A. pinsapo is quite resistant to putrefaction and used for piles and sleepers. The wood of *A. alba Mill.* (= *A. pectinata* DC; European silver fir) and of other Abies species is not very resistant to moisture, but is much appreciated for cabinet making, piling, construction, fencing, packaging, hardboard, etc.

b. In medicine: Abies alba, as well as other species of the genus is rich in volatile oils, above all monoterpenoids; these act as expectorants, are antirheumatic, sedatives, and sometimes skin irritants. TEM, TNAM.

Fig. 12.1f: *Abies alba* Mill.: Shape [Kew, London]

Araucaria araucana (Molina) K. Koch
Syn.: *Araucaria imbricata* Pavón; *Pinus araucana* Molina
E: Monkey puzzle, Chile pine
Sp: Pehuén, araucaria, piñonero, pino araucaria, piñón, pino chileno, araucaria chilena, araucaria de Neuquén, pino de Neuquén, pino, pino piñonero, chiquillanes, gúilliu (nombre del "fruto"), huén (en mapuche)
Fam.: Araucariaceae

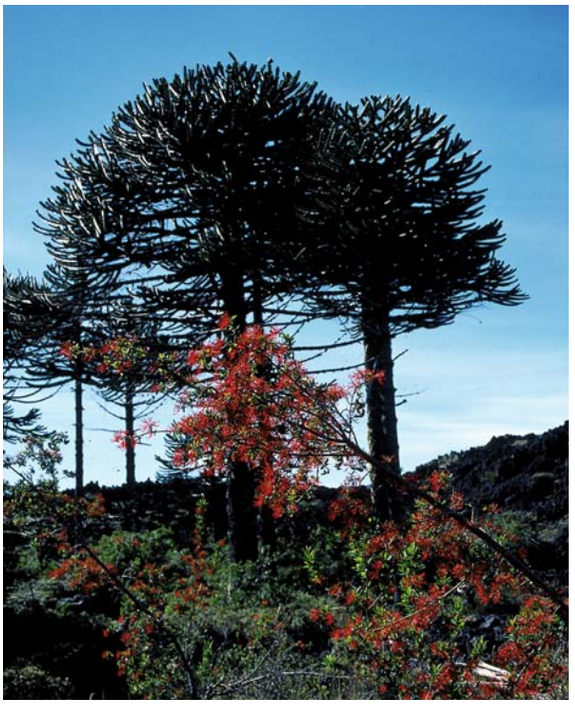


Fig. 12.2a: *Araucaria araucana* (Molina) K. Koch: shape [PN Conguillío]

Evergreen, dioecious tree, up to 50 m tall, with a parasol-like crown. *Trunk* upright, cylindrical; *bark* very thick and wrinkled, breaking up into plates. *Branches* in whorls of 5 to 7, long, cylindrical, bearing the leaves towards their end. *Leaves* arranged spirally, sessile, overlapping, leathery, rigid, 2.5–3 cm long and 1.5–2 cm across, dark-green; blade oval-lanceolate, with a broad base and a sharply pointed apex. *Male cones* terminal, amentaceous, cylindrical, 8–12 cm long; female cones terminal, 10–15 cm across. *Ripe cones* bearing 120–180 seeds, 4–5 cm long and 1.5 cm across.– Fl. 8–9. Fr. (ripe seeds) 3–4 (17–19 months after blooming).

Status and distribution: Native; in Argentina: NE, RN, mainly between the lakes of Ñorquinco and Huechulafquen; in Chile: in two well-defined zones: Cordillera de Nahuelbute, 37°40'–38°40' (Region VIII) and Cordillera de los Andes, 37°30'–40°03' (Region IX).

Fig. 12.2b: *Araucaria araucana* (Molina) K. Koch: bark

Fig. 12.2c: *Araucaria araucana* (Molina) K. Koch: twig

Habitat: On sandy, rocky, usually volcanic, well-drained soils, at altitudes where the snow stays for long. It associates with several species of *Nothofagus*, the undergrowth present with *Chusquea culeou*, *Drimys winteri*, and several species of *Berberis*.
Elevation: 600–1400 m.
Hardiness: –28° C.
Uses:
a. Wood: used in construction, carpentry, for shingles, floors, barrels, boat-building, paper production;

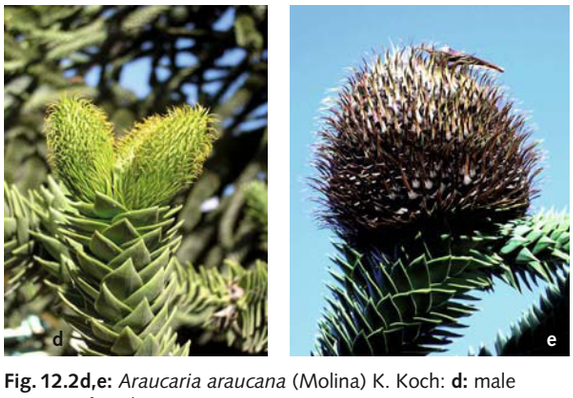


Fig. 12.2d,e: *Araucaria araucana* (Molina) K. Koch: **d:** male cones; **e:** female cones

Fig. 12.2f: *Araucaria araucana* (Molina) K. Koch: seed

b. Seeds (piñones): edible; the seeds, rich in proteins and carbohydrates, are highly prized by the Aborigines.

c. In medicine: In the wood of *Araucaria* sp., several lignans (e.g. (+)-endesmin, cis-hinokiresinol, laricinresinol, pinoresinol). Lignans, in general, have antitumour and antiviral activity. In popular medicine, the resin of *A. araucana* is used e.g. against ulcers of the skin and headaches. TSAM.

Remark: In the warmer areas of Patagonia (e.g. El Bolsón), *A. angustifolia* (Bert.) Kuntze, native to north-eastern Argentina and southern Brazil, can be grown. This species has slender, elegant branches, bearing lanceolate leaves, less than 1 cm across, tapering to a fine point. *A. bidwillii* Hook. (Bunya Bunya), from Australia, is also grown ornamentally and in plantations, in more temperate areas: its lanceolate or ovate-lanceolate leaves are set wider apart than in *A. araucana*. Its edible seeds were highly prized by the Aborigines.

A. araucana is appreciated as an ornamental species. It is a protected species according to CITES-I.

Fig. 12.2g: *Araucaria angustifolia* (Bert.) Kuntze: Shape [El Bolsón]

Fig. 12.2h: *Araucaria angustifolia* (Bert.) Kuntze: bark

Fig. 12.2i: *Araucaria angustifolia* (Bert.) Kuntze: twig

Fig. 12.2j: Comparison of *A. angustifolia* and *A. araucana*: Twigs: *A. angustifolia* (left) and *A. araucana* (right)

Austrocedrus chilensis (D. Don) Florin et Boutelje
Syn.: *Thuja chilensis* D. Don, *Libocedrus chilensis* (Don) Endl.
E: Chilean cedar
Sp: Ciprés de la cordillera, ciprés de los Andes, lipain, lahuán, ciprés, cedro, len (en mapuche), ciprés del sur
Fam.: Cupressaceae

Fig. 12.3a: *Austrocedrus chilensis* (D. Don) Florin et Boutelje: **a1:** shape (1 stem) [El Bolsón]; **a2:** shape (2 stems) [Trevelin]

Evergreen, monoecious tree, up to 20 m tall; *crown* pyramidal, compact. *Trunk* conical, upright. *Bark* rugose, longitudinally fissured, grey-brown in the lower parts, ash-grey in the upper ones. *Sprays* flattened, in one plane. *Leaves* opposite, scale-like, perennial, imbricate, of two types: the *lateral,* keeled and with 2 whitish stomatic bands, 2–5 mm long; the *facial,* triangular, 0.5–2 mm long. *Male cones* amentaceous, at the end of the twigs, 1–1.5 cm long; *female cones* composed of 4 opposite scales, 1–1.5 cm long. *Seeds* winged ovoid, 5 mm long and 3 mm across. Fl. 10–12. Fr. 1–3.

Status and distribution: Native, in Argentina: CHU, NE, RN, TF; in Chile: from the Prov. of San Felipe de Aconcagua to the river Palena (Regions V-X).

Fig. 12.3b: *Austrocedrus chilensis* (D. Don) Florin et Boutelje: bark

Fig. 12.3c: *Austrocedrus chilensis* (D. Don) Florin et Boutelje: wig (upper side)

Fig. 12.3d: *Austrocedrus chilensis* (D. Don) Florin et Boutelje: twig (underside)

Habitat: Mainly on slopes exposed to the north, (semi-) arid areas, poor, eroded soils.
Elevation: 350–1800 m.
Hardiness: –12° C.
Uses: a. Wood: Light, lasting and resistant; used for smaller pieces of furniture, poles, stakes in vineyards, etc.
b. In popular medicine: Against fever. TSAM.
Austrocedrus is used to reforest; besides, it has ornamental value.

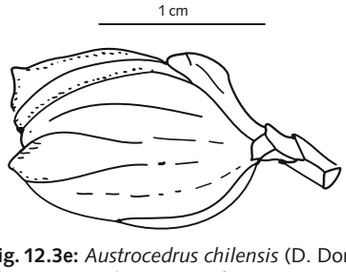


Fig. 12.3e: *Austrocedrus chilensis* (D. Don) Florin et Boutelje: cone. (After Dimitri (1982), fig. 2, modified; draughtsman: C. Yáñez; with the permission of the INTA.)

Calocedrus decurrens (Torrey) Florin
Syn.: *Libocedrus decurrens* Torrey
E: Incense cedar, Oregon cypress, white cedar
Sp: Libocedro, ciprés de Oregón, tuya gigante, cedro-incienso, cedro blanco de California, cedro bastardo
Fam.: Cupressaceae

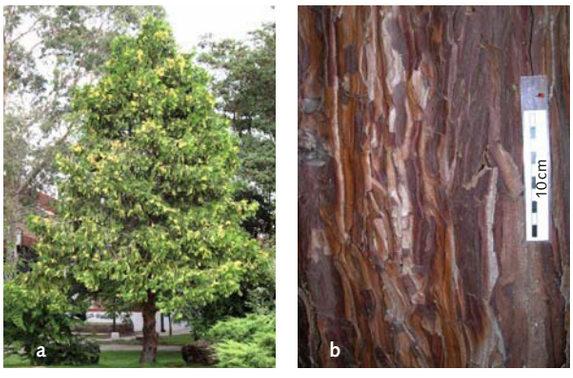


Fig. 12.4a,b: *Calocedrus decurrens* (Torrey) Florin: **a:** shape [Neuquén]; **b:** bark

Evergreen, monoecious tree, up to 45 m tall; *crown* columnar to pyramidal. *Bark* cinnamon-red, broken into irregular scaly ridges. *Twigs* flattened, each arranged in one plane. *Leaves* scale-like, opposite and decussate, strongly decurrent, of two types: the *facial* pair small, triangular; the *lateral* pair keeled, with a cuspidate 3 mm long tip. *Male cones* solitary, terminal; *female cones* ovoid-oblong, 2–2.5 cm long, composed of 3 pairs of valvate scales, only the second pair fertile.

Status and distribution: Introduced; native to western USA (Oregon to California). In Patagonia, mainly ornamental.

Hardiness: –20° C.

Remark: Some forms, e.g. *C. decurrens* var. *aurovariegata*, have occasional splashes of yellow in their foliage.

Uses: a. Wood: For cabinet making, veneers, domestic or industrial use, fencing, packaging.

b. In medicine: Calocedrus, as all Cupressaceae, contains deoxypodophyllotoxin, a lignan, which has antitumour and antiviral (e.g. against herpes simplex I and measles) activities.

Remark: See comparison of twigs and cones of *C. decurrens* and *Thuja orientalis* in **Fig. 12.33e.**

Fig. 12.4c: *Calocedrus decurrens* (Torrey) Florin: twig

Fig. 12.4d: *Calocedrus decurrens* (Torrey) Florin: hanging branch

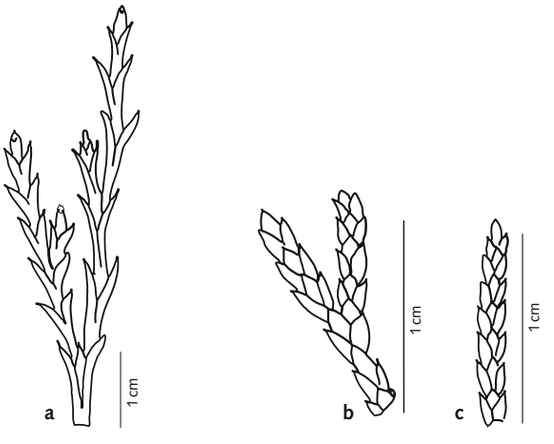


Fig. 12.4e: Twigs of **a:** *C. decurrens*; **b:** *Thuja orientalis*; **c:** *Thuja occidentalis*

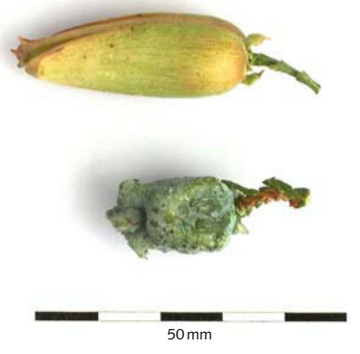


Fig. 12.4f: Cones of *C. decurrens* (above) and *Thuja orientalis* (below)

Cedrus atlantica Manetti
E: Atlas cedar, Algerian cedar, cedar
Sp: Cedro del Atlas, cedro africano, cedro
Fam.: Pinaceae

Fig. 12.5a: *Cedrus atlantica* Manetti: shape [Lago Puelo]

Evergreen, monoecious tree, up to 40 m tall; *crown* broadly pyramidal. *Bark* greyish and smooth when young, deep chestnut-brown with age, fissured, with small flakes. *Branches* extended, rigid, not drooping; *twigs* shortly pubescent. *Leaves* needle-like; on long leading shoots, solitary; on spur shoots, in fascicles of numerous units, 1.5–2.5 cm long. *Female cones* 5–7 cm long, with a depressed apex, breaking up before falling. – Fl. 3–4. Fr. (ripe cones) 2–5.

Fig. 12.5b: *Cedrus atlantica* Manetti: branch

Status and distribution: Introduced; native to Algeria and Morocco, from 1500–2400 m. In Patagonia, ornamental, above all the various *formae glaucae*, with grey-blue foliage, and the *formae argentae*, with silvery-white foliage.

Fig. 12.5c: *Cedrus atlantica* Manetti: female cone

Hardiness: –16° C.

Remark: C. libani A. Richard (Cedar of Lebanon) has longer leaves (2.5–3 cm long) and longer cones (8–10 cm long), with an obtuse (rounded) apex; twigs glabrous or slightly pubescent. *C. deodara* (D. Don) G. Don (Indian Cedar, Deodar) has a slightly inclined top of the trunk, and the end of the branches droops a little; twigs densely pubescent.

Uses (for all species of *Cedrus*):

a. Wood: For cabinet making, decorative work, domestic and industrial work, fencing, gates, etc.

b. In medicine: Particularly two species: *C. libani*, with borneol (a monoterpenoid) in the volatile oil, used in perfumery, and *C. deodara*, which contains several sesquiterpenoids (e.g. centarol) with a spasmolytic activity. The essential oils act as an expectorans, are antiseptic and sedative. TIM; TEM.

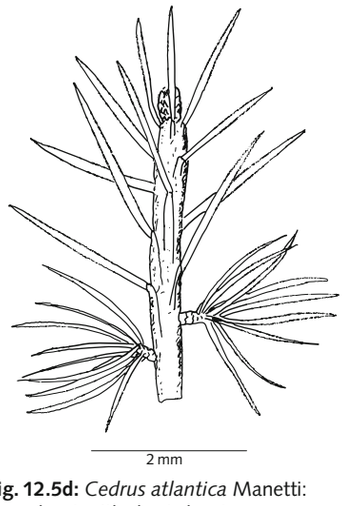


Fig. 12.5d: *Cedrus atlantica* Manetti: long shoot with short shoots

Fig. 12.5e: *C. deodara* (G. Don) D. Don: male cones

Fig. 12.5f: *C. libani* A. Richard: twig

Fig. 12.5g: *C. libani* Richard: female cone

Chamaecyparis lawsoniana (Murray) Parlatore
Syn.: *Cupressus lawsoniana* A. Murray
E: Lawson cypress
Sp: Ciprés de Lawson, cedro de Oregón, falso ciprés
Fam.: Cupressaceae

Fig. 12.6a: *Chamaecyparis lawsoniana* (Murray) Parlatore: crown with drooping main shoots [Esquel]

Evergreen, monoecious tree, up to 60 m high in his natural habitat; *crown* pyramidal to columnar; the *topmost shoot* of the stem and the main branches droop over. *Bark* chestnut-red, longitudinally fissured, flaking. *Leaves* scale-like, densely overlapping, in opposite and decussate pairs, acute, the *facial* pair ovate-triangular, with a dorsal gland, the *lateral* pair keeled, longer; *twigs* aromatic. The *underside* of the *twigs* show X-shaped white marks where leaves meet. *Male cones* terminal, solitary. *Female cones* in groups at the end of the twigs, globose, with about 8 fertile, subpeltate, opposite seed-scales, 0.7–1 cm in diameter, first blue-green, brown when mature; *seed-scales* with a small, acute, reflexed mucro. *Seeds* winged.– Fl. 10–11. Fr. (mature seeds) 2–4.

Status and distribution: Introduced; native to north-western California and south-western Oregon. *Habitat:* Mountain slopes and canyons, from 0–1500 m. In *Patagonia,* ornamental.

Hardiness: –32° C.

Remark: C. obtusa (Sieb. et Zucc.) Endl. has obtuse, glandless leaves, the lateral much longer than the facial; in *C.*

Fig. 12.6b: *Chamaecyparis lawsoniana* (Murray) Parlatore: bark

nootkatensis (D. Don) Sudw., facial and lateral leaves are of almost equal length, and twigs green on both sides.
Uses: The wood is used for domestic and industrial purposes, fencing, packaging, etc.

Fig. 12.6c,d: *Chamaecyparis lawsoniana* (Murray) Parlatore: **c:** twig with young cone; **d:** twig with ripe cones

Cryptomeria japonica (Thunberg ex Linnaeus f.) D. Don
E: Japanese cedar, sugi (Japanese)
Sp: Criptomeria, cedro japonés, cedro de Japón, sugi
Fam.: Taxodiaceae

Fig. 12.7a: *Cryptomeria japonica* (Thunberg ex Linnaeus f.) D. Don: shape [Valdivia]

Evergreen, monoecious tree, up to 50 (65) m tall, with a slender and straight trunk; *crown* conical, dense. *Bark* reddish brown, soft, peeling off in strips. *Branches* more or less whorled, spreading horizontally, or slightly pendulous; branchlets generally pendulous, shoots green. *Leaves* needle-like, alternate, 0.5–1.5 cm long, pale green, keeled, awl-shaped, curved forward along the shoot and tapering to a point; soft to the touch (namely var. *sinensis*). *Male cones* yellow-brown, in numerous, axillary groups, sessile, ovoid, 2.5–5 (8) mm long. *Female cones* at the tips of the shoots, borne in groups of 1–6, subspherical to spherical, 1.5–3 cm long, with 20–30 seed scales; ripe cones woody, brown. *Seeds* 2–5 on each scale, 4–6 mm long, with rudimentary wings.

Status and distribution: Introduced, native to China and Japan (var. *japonica* native only to Japan).

Habitat: Deep, moist, well-drained soils. *Elevation:* In Japan, up to 2500 m. *C. japonica* has been introduced in many temperate regions of the planet. Large plantations, e.g. on the Azores. In *Patagonia,* mainly ornamental.

Hardiness: –24° C.

Remark: Var. *sinensis* has a looser habit; its leaves are strongly curved from their base onwards; var. *japonica* has rather straighter leaves which are curved towards their apex.

Uses: Wood of high quality and manifold uses, e.g. furniture, construction, domestic purposes.

Fig. 12.7b: *Cryptomeria japonica* (Thunberg ex Linnaeus f.) D. Don: branch

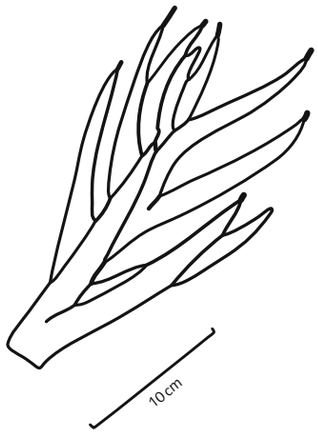


Fig. 12.7c: *Cryptomeria japonica* (Thunberg ex Linnaeus f.) D. Don: twig

Cupressus L.

Evergreen, monoecious, resinous trees. *Leaves* scale-like, in opposite and decussate pairs, densely crowded and appressed, hiding the axis; *tips* of leaves free, acute; on strong *long shoots,* leaves with long, connate basal parts; on *short shoots,* leaves shorter. *Male cones* catkin-like, terminal, solitary. *Female cones* globose, terminal, solitary, with about 8 fertile, thick, peltate scales; cones ripening in the second year, woody.

With the following key (adapted from J. Do Ameral Franco, *Flora Europaea,* vol. I, 2nd ed. 1993, p. 45) we can distinguish the four most often cultivated species: *C. arizonica* (rough-barked cypress, Arizona cypress, red-barked cypress), *C. lusitanica* (Portuguese cypress, Mexican cypress, cedar of Goa), *C. macrocarpa* (Monterey cypress), *C. sempervirens* (Italian cypress).

Key to the 4 most common species of *Cupressus*:

1. –	Leaves obtuse, closely appressed; female cone green when young, cone-scales 8–14	→ 2.
–	Leaves acute to acuminate, free at the apex; female cone glaucous when young, cone-scales 6–8	→ 3.
2. –	Leaves on lateral twigs 0.5–1 mm; male cones 4–8 mm; ripe female cone yellowish-grey	→ *C. sempervirens* L.
–	Leaves on lateral twigs 1–2 mm; male cones 3–5 mm; ripe female cone brown	→ *C. macrocarpa* Hartweg ex Gordon
3. –	Leaves greyish when young, emitting a disagreeable odour when rubbed; female cone up to 3 cm	→ *C. arizonica* Greene
–	Leaves green to glaucous, not emitting a disagreeable odour; female cone 10–15 mm	→ *C. lusitanica* Mill. (= *C. glauca* Lam.)

The most frequently cultivated species of *Cupressus* in Patagonia is *C. macrocarpa*.

Cupressus macrocarpa Hartweg ex Gordon
E: Monterey cypress
Sp: Ciprés lambertiana, lambertiana, ciprés de Monterrey, ciprés macrocarpa
Fam.: Cupressaceae

Fig. 12.8a: *Cupressus macrocarpa* Hartweg ex Gordon: shape [Perito Moreno]

Evergreen, monoecious tree, up to 20 m tall; *crown* broad, irregular, the main branches obliquely elongated. *Bark* red-brown, separating into broad, scaly ridges. *Twigs* emanate a scent of citronella when pressed. *Leaves* scale-like, opposite and decussate, densely crowded, rhombic-ovate, 1–2 mm long. *Male cones* terminal, solitary. *Female cones* globose, to 4 cm in diameter, brown, composed of about 8 fertile, peltate, thick seed-scales, each seed-scale bearing an apical, dorsal, prickle (umbo).

Status and distribution: Introduced; native to California (Monterrey). A species of vast ecological amplitude. In *Patagonia,* an ornamental tree, also used to form living fences.

Hardiness: –16° C.

Remarks: The genus *Cupressus* comprises about 13 species, all native to the northern hemisphere, especially in climates of Mediterranean type. It is often difficult to distinguish the species from each other.

Fig. 12.8b: *Cupressus macrocarpa* Hartweg ex Gordon: bark

Fig. 12.8c: *Cupressus macrocarpa* Hartweg ex Gordon: twig

Uses:

a. Wood: The four species here described have wood with manifold uses; in general, the wood of *C. lusitanica* and *C. sempervirens* is considered to be of higher value than that of *C. macrocarpa* and *C. arizonica,* which are used for industrial purposes, fencing, packaging, etc.

b. In medicine: See entry in *Calocedrus*. Several species of *Cupressus* contain β-thujaplicin and γ-thujaplicin, monoterpenoids with an antifungal activity. They are also antispasmodic. TEM.

Fig. 12.8d: *Cupressus arizonica* Greene: **d1:** young bark; **d2:** mature bark

Fig. 12.8e: *C. arizonica* Greene: twig with female cones

Fig. 12.8f: *Cupressus sempervirens* L.: Bark

Fig. 12.8g: *C. sempervirens* L.: female cones

Fig. 12.8h: Comparison: female cones of *C. arizonica* (above) and *C. macrocarpa* (below)

Fig. 12.8i: *C. sempervirens* L.: twig

Fig. 12.8k: Comparison: Twigs of *C. arizonica* (above) and *C. macrocarpa* (below)

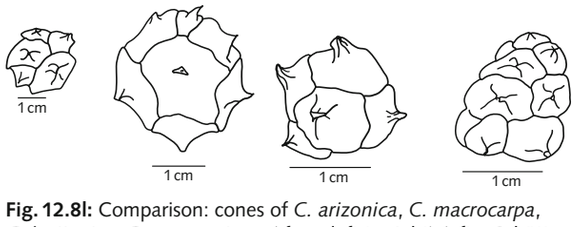


Fig. 12.8l: Comparison: cones of *C. arizonica*, *C. macrocarpa*, *C. lusitanica*, *C. sempervirens* (from left to right) (after Schütt and Dimitri (1982), fig. 58, 57, 59, modified; draughtsmen: C. Yáñez (58, 57), V. Barletta (59); with the permission of the INTA.)

Fitzroya cupressoides (Molina) I.M. Johnst.
Syn.: *Pinus cupressoides* Molina, *Fitzroya patagonica* Hook. f. ex Lindl., *Libocedrus cupressoides* (Molina) Kuntze
E: Patagonian cypress
Sp: Alerce, alerce chileno, alerce patagónico, lahuán, lahuén
Fam.: Cupressaceae

Fig. 12.9a: *Fitzroya cupressoides* (Molina) I.M. Johnst.: shape [PN El Alerce Andino]

Evergreen, dioecious tree, up to 60 m tall; *crown* narrow, elongated, pyramidal. *Bark* red-brown, with long, deep furrows. *Leaves* in whorls of 3, scale-like, 2.5–3 mm long, dark green, with two white bands on each side. The *shoots* appear triangular in a cross-section. *Male cones* axillary, solitary, small; *female cones* at the tip of the shoots, solitary, sub-globose, 4–8 mm long. *Seeds* with 2–3 small wings, 2–4.5 mm across. Fl. 12–3. Fr. 3.

Status and distribution: Native; in Argentina: CHU, NE, RN, mainly around Puerto Blest and in the PN Los Alerces; in Chile: from the Prov. of Valdivia to de Prov. of Chiloé (Region X).

Elevation: 700–1400 m.

Habitat: Prefers moist to wet, boggy soils, with more than 2000 mm annual rainfall. It associates with *Pilgerodendron uviferum, Saxegothaea conspicua, Nothofagus dombeyi*.

Hardiness: –16° C.

Uses: Light, lasting wood, nearly rot-proof: Used for roofs, coatings, furniture, barrels, boats, poles.

Remarks: It was over-exploited; a protected species in Argentina and Chile, in accordance with CITES-I. *Fitzroya cupressoides* is very ornamental and may be an alternative to *Chamaecyparis lawsoniana*.

Fig. 12.9b: Young *Fitzroya* pushing up between *Nothofagus dombeyi*, on the south-exposed slope of Lago Nahuel Huapi. The *Fitzroya* had been chopped down in this area in the late 19th Century. With the kind permission of Dr. Fred Marquis (03.03.2000)

Fig. 12.9c: *Fitzroya cupressoides* (Molina) I.M. Johnst.: bark

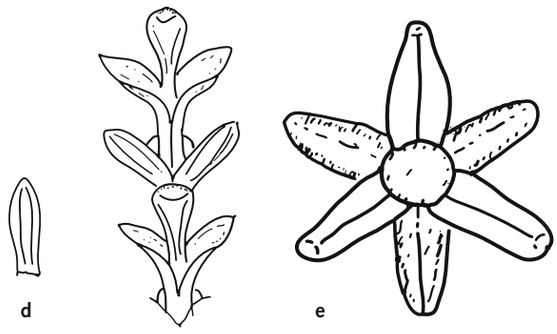


Fig. 12.9d,e: *Fitzroya cupressoides* (Molina) I.M. Johnst.: **d:** twig and leaf; **e:** twig from above showing the whorls of three leaves

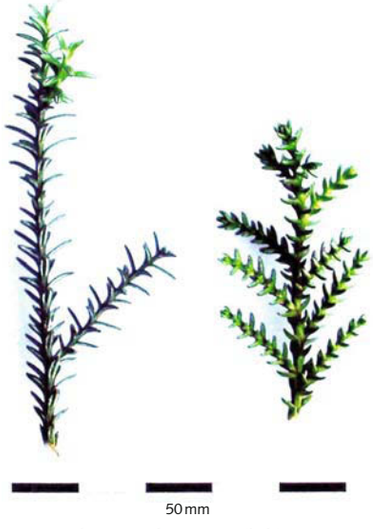


Fig. 12.9f: Twig of *Fitzroya* (left) and *Pilgerodendron* (right) (see also *Pilgerodendron uviferum* (D. Don) Florin)

Fig. 12.10b: *Ginkgo biloba* L.: bark

Ginkgo biloba L.
E: Maidenhair tree
Sp: Ginkgo, gingo, árbol de los 40 escudos (o ducados), árbol de la pagoda, árbol de oro, fruto de plata, árbol de la vida
Fam.: Ginkgoaceae

Fig. 12.10a: *Ginkgo biloba* L.: Shape [Belvoir Park, Zürich]

Deciduous, dioecious tree, up to 40 m tall; *crown* conical or pyramidal. *Bark* grey-brown, thick, ridged, fissured. *Branches* straight, more or less erect. *Leaves* on *long shoots,* single; on *spur shoots,* in clusters of 3 to 5; *blade* fan-shaped, 3–8 cm across, on *long shoots* often deeply notched in the middle, on *spur shoots* more or less entire; numerous *veins* diverging from the base; *petiole* 5–7 cm long. *Male flowers* amentaceous, yellowish; *female flowers* reduced to two na-

ked ovules, with one peduncle in common. *Seed* drupe-like, yellow-green, emitting an unpleasant smell. Kernel edible.– Fl. 10–11. Fr. (ripe seeds) 2–5.

Status and distribution: Introduced; native to the provinces of Zhejian and Guizhou (eastern China). The species has been cultivated since time immemorial. In *Patagonia,* slowly gaining in popularity.

Hardiness: –28° C.

Remarks: After pollination, the pollen tube grows into the nucellus of the ovule. Only after a certain time, it releases swimming sperm cells, one of which fertilizes the egg cell.– The fleshy seeds can cause a cutaneous irritation.

Uses:

In medicine: The pseudo-fruits (seeds) of *G. biloba* contain phenols and phenolic acids which have antitumour and antimicrobial activities. The leaves contain the diterpenoid ginkgolide A, which has bronchodilator and anti-asthmatic activities. TCM; TEM; MM.

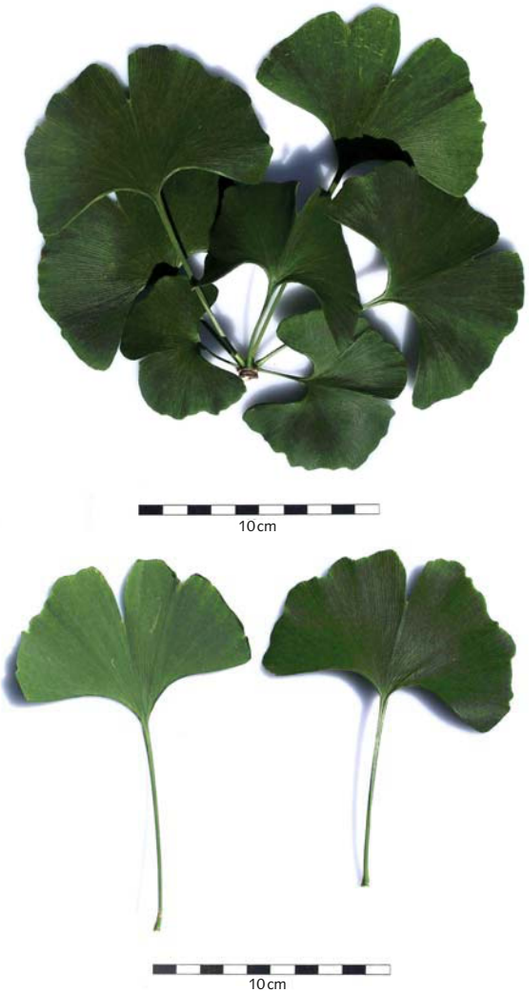


Fig. 12.10c,d: *Ginkgo biloba* L.: **c:** branch; **d:** leaves

Juniperus communis L.

E: Common juniper
Sp: Enebro común, enebro real
Fam.: Cupressaceae
(†)

Fig. 12.11a: *Juniperus communis* L.: shape [PN Lanín]

Evergreen, monoecious or dioecious shrub or small tree, up to 12 m tall; *crown* of the trees usually pyramidal. *Bark* red-brown, peeling in strips. *Leaves* almost needle-like, in whorls of 3 (sometimes opposite), 1–2 cm long and 1–2 mm across, tapering to a spiny point, the *upper side* with a white band. *Male cones* axillary, ovoid-globose, yellow; *female cones* axillary, globose: the seed-scales are intimately fused together and fleshy, giving rise to a blue or black-blue false "berry", 5–8 mm in diameter, containing 1–3 angled *seeds.*– Fl. 10–1. Fr. 2–4.

Status and distribution: Introduced; native to the temperate zones of the Northern Hemisphere.

Habitat: Open places, from the seashore to high mountains. In *Patagonia,* ornamental.

Hardiness: –40° C.

Remarks: J. communis is enormously variable. The genus *Juniperus* includes species which have scale-like leaves, e.g. *J. virginiana* L. (eastern real cedar, pencil cedar, red cedar), with needle-like *juvenile* leaves in pairs, but scale-like *adult* leaves. All *Juniperi* bear berry-like cones,

Fig. 12.11b: *Juniperus communis* L.: branch with false fruits

albeit of different colours.– The berry-like cones of *J. communis* are slightly poisonous; on the other hand, the entire plant of *J. virginiana* is extremely poisonous, †††.

Uses:

a. Wood: J. virginiana has highly appreciated wood used for cabinet making und decorative work; *J. communis* has less valuable wood, for domestic and industrial uses.

b. In medicine: The leaf oils of *J. communis* contain cadinenes and other sesquiterpenoids used in perfumery. The plant has also diuretic, antiseptic and antiheumatic properties. *J. virginiana* contains several lignans (see entry in *Calocedrus*) and the toxic monoterpenoid sabinol, which is used as an emmenagogue, antihelmintic, and as an abortifacient; it is also used against warts. TEM.

Larix decidua Mill.

Syn.: *Larix europaea* DC., *Larix larix* (L.) Karsten, *Pinus larix* L.

E: European larch

Sp: Alerce europeo, alerce común, alerce, lárice

Fam.: Pinaceae

Fig. 12.12a: *Larix decidua* Mill.: shape [Valdivia] (with the permission of P. Lépez)

Deciduous, monoecious tree, up to 35 (50) m tall; *crown* pyramidal, the *branches* arched, with the tip pointing upwards, elastic. *Bark* grey, becoming red-brown with age, fissured, scaly. *Leaves* needle-like, soft, bright grass-green, 1–4 cm long, solitary at the end of *long shoots,* in whorls of 30–40 on *spur shoots,* turning gilded-yellow in autumn.

Fig. 12.11c: *Juniperus communis* L.: twig

Fig. 12.12b: *Larix decidua* Mill.: branch

Male cones ovoid, yellow; *female cones* upright, red, at the time of pollination, grey-brown, ovoid, 2.5–5 cm long when mature. *Seeds* winged.– Fl. 10. Fr. (ripe seeds) 3–6.
Status and distribution: Introduced; native to northern and central Europe.
Habitat: Mountains, chiefly the Alps and the Carpathians, up to 2200 m. In *Patagonia,* mainly ornamental.
Hardiness: –36° C.
Uses:
a. Wood: High quality wood, used for furniture, coatings, construction.
b. In medicine: The wound resin contains the lindan lariciresinol, an antitumour agent.
Besides, the resin has astringent, diuretic, and antiseptic properties. TEM.

Fig. 12.12c: *Larix decidua* Mill.: bark (with the permission of P. Lépez)

Metasequoia glyptostroboides Miki ex Hu et Cheng

Syn.: *Metasequoia glyptostroboides* Hu et Cheng; *Sequoia glyptostroboides* (Hu et Cheng) Weide
E: Dawn redwood, water fir
Sp: Metasecuoya, Secuoya de hojas caedizas, Secuoya
Fam.: Taxodiaceae

Fig. 12.13a,b: *Metasequoia glyptostroboides* Miki ex Hu et Cheng: **a:** shape; **b:** bark

Fig. 12.13c: *Metasequoia glyptostroboides* Miki ex Hu et Cheng: twig

Fig. 12.13d: *Metasequoia glyptostroboides* Miki ex Hu et Cheng: twig in autumn

Monoecious, deciduous tree, up to 45 m tall, developing a slender, conical *crown*. *Bark* orange-brown to chestnut, with vertical stringy, but hard ribs. Main *branches* slender, ascending; *secondary branches* persistent, bearing alternate *single leaves* and lateral, opposite, *deciduous twigs* –short shoots– which in their turn bear 20–40 pairs of *opposite* leaves in two ranks. *Leaves* linear to needle-like, flattened, *soft* to touch, 0.8–2 cm long, upper side blue-green, underside yellowish. In autumn, the leaves turn orange-yellow before they fall off together with the short shoots. The persistent twigs develop in summer prominent, ovoid replacing buds on the nearer side of the nodes wherefrom the deciduous twigs emerge. *Female cones* ovoid, 2 cm long, green at first, turning brown with maturity, borne on axillary, up to 3 cm long, woody stalks.

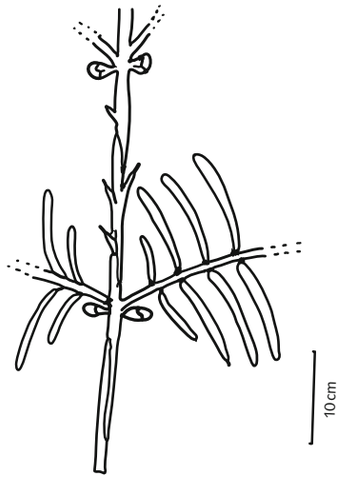


Fig. 12.13e: *Metasequoia glyptostroboides* Miki ex Hu et Cheng: twig with buds

Seeds about 3 mm long, double-winged.

Status and distribution: Introduced; native to China, now almost extinct except patches in the Hubei province of China. Cultivated from times immemorial.

Habitat: Moist ground and riverbanks.

Hardiness: –20° C.

Remarks: Very ornamental species that needs space; it has been widely spread in Europe and North America since its re-discovery in 1945. In Patagonia, some specimens on the Isla Victoria (Lake Nahuel Huapi).

A closely related, often cultivated species is *Taxodium distichum* (L.) Rich. (*Cupressus disticha* L., swamp cypress), native to south eastern North America, with *alternate* deciduous twigs and female cones around 3 cm long.

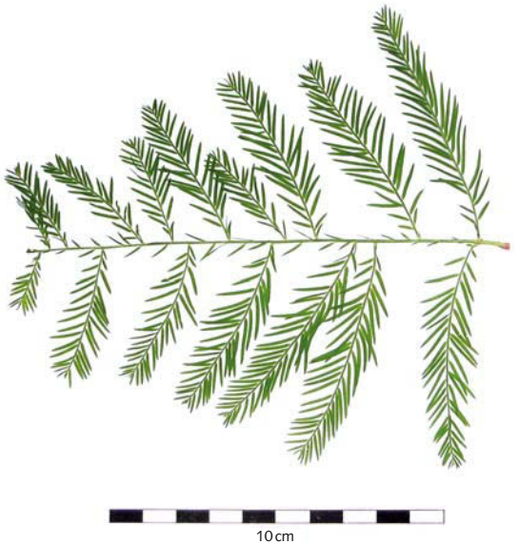


Fig. 12.13f: *Taxodium distichum* (L.) Rich.: twig

Picea abies (L.) Karsten

Syn.: *Pinus abies* L.

E: Norway spruce

Sp: Abeto rojo, pino spruce, spruce, spruce de Noruega, falso abeto, pinabete, árbol de Navidad, pino abeto, pícea

Fam.: Pinaceae

Fig. 12.14a: *Picea abies* (L.) Karsten: shape as roadside tree [Los Antiguos]

Evergreen, monoecious tree, up to 50 m tall; *crown* conical to sub-cylindrical; *branches* whorled, arched. *Bark* chestnut-red, with fine scale when middle-aged. *Leave-bearing twigs* opposite, pink-brown yellow-brown, traced by protruding ribs or swellings (pulvini), nearly always reflexed and drooping. *Leaves* needle-like, 1–1.5 (2.5) cm long, arranged spirally, arched towards the tip of the shoot, four-sided, dark green; *apex* acute. *Male cones* ovoid, axillary or terminal, 2–2.5 cm long, reddish or pink-carmine. *Mature female cones* hanging, cylindrical, 10–18 cm long and 3–4 across. *Seeds* small, winged.– Fl. 10–12. Fr. (mature cones) 3–8.

Status and distribution: Introduced; native to Europe and northern Asia.

Fig. 12.14b: *Picea abies* (L.) Karsten: bark

Habitat: On mountain slopes and on acid soils. In *Patagonia,* in various plantations; also appreciated as an ornamental species.

Hardiness: –28° C.

Remarks: The genus *Picea* comprises about 40 species in the northern hemisphere, particularly distributed in the cool temperate latitudes. Other species cultivated in Patagonia include: (1) *P. pungens* Engelm. (Colorado spruce, American spruce, North American spruce: native to the western USA) which has a *bark* that is pale grey to dark grey, its *twigs* have grey-brown shoots, and its *leaves,* more or less radially spreading at right angles, are rigid, pungent, 1.5–3 cm long, bluish-green, very aromatic when rubbed; its *female cones* are 6–10 cm long.– (2) *P. glauca* (Moench) Voss (white spruce, native to the northern USA and to Canada), very popular as an ornamental species, that bears glaucous to greyish-green, obtuse or acute *leaves,* 1–2 cm long, and

Fig. 12.14c: *Picea abies* (L.) Karsten: branch

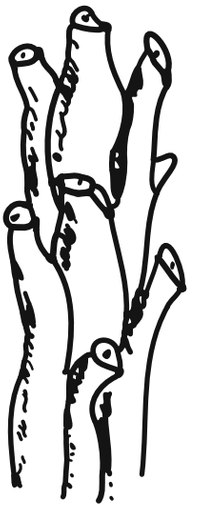


Fig. 12.14d: *Picea abies* (L.) Karsten: defoliated twig with protruding ribs (pulvini)

female cones, 3–6 cm long. The leaves release an unpleasant scent when squeezed.

Uses:

a. Wood: P. abies produces wood which has a large variety of uses: for construction, frames, packing, musical instruments, chipboard, etc.

b. In medicine: The volatile oils of *Picea,* as well as those of *Abies* and *Pinus* spp. contain several monoterpenoids (e.g. β-phellandrene), which are used as expectorants. Besides, these genera contain stilbenoids with antifungal and antiba

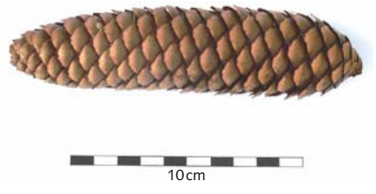


Fig. 12.14e: *Picea abies* (L.) Karsten: cone

Fig. 12.14f: *Picea pungens* Engelm.: bark

Fig. 12.14g: *Picea pungens* Engelm.: branch

Fig. 12.14h: *Picea pungens* Engelm.: cones

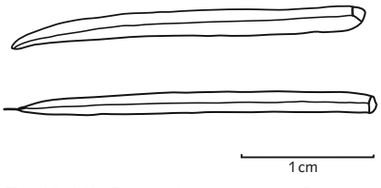


Fig. 12.14i: Comparison: needles: *P. abies* (above), *P. pungens* (below)

Pilgerodendron uviferum (D. Don) Florin
Syn.: *Juniperus uvifera* D. Don, *Libocedrus tetragona* (Hook.) Endl., *Thuja tetragona* Hook
E: (?)
Sp: Ten, ciprés de las Guaitecas, ciprés de las Guaytecas, ciprés chileno, cedro, lahuán, ciprés, len, lipián
Fam.: Cupressaceae

Fig. 12.15a: *Pilgerodendron uviferum* (D. Don) Florin: young forest [Puerto Toro]

Evergreen, monoecious tree, up to 20 (35) m tall; *crown* narrow, open. *Bark* rough, red-brown (not as red as that of *Fitzroya*), flaking in long strips. *Leaves* opposite-decussate, corniculate- scale-like, overlapping, 2–4 mm long, dark green. The leaves confer to the *twigs* a quadrangular ap-

Fig. 12.15b: *Pilgerodendron uviferum* (D. Don) Florin: shape [PN El Alerce Andino]

pearance in a cross-section or when looked upon from the twigs end. *Male cones* amentaceous, 5 mm long; *female cones* ovoid, greyish, 8–12 mm long, composed of two pairs of opposed seed-scales, each carrying a long mucro. *Seeds* 3–4, mutually free, two-winged, 3 mm long and 1.5 mm across. Fl. 10–12. Fr. 1–3.

Status an distribution: Native; in Argentina: NE, RN, SC, TF, particularly between Puerto Blest and Lago Frías; in Chile: from the Prov. of Valdivia to Tierra del Fuego (Regions X-XII). It is the southernmost conifer.

Habitat: Occurs in swampy, boggy soils. In the northern regions, it associates with *Fitzroya cupressoides;* farther south, with *Nothofagus betuloides, N. pumilio, N. antarctica, N. nitida* (in Chile).

Elevation: 0–600 m.

Uses: Light, aromatic wood, nearly rot-proof: Used in boat-building, for piers, furniture, poles.

Remark: Excessively exploited, it is a protected species in Argentina and Chile: CITES-I.

Fig. 12.15c: *Pilgerodendron uviferum* (D. Don) Florin: bark

Fig. 12.15e: *Pilgerodendron uviferum* (D. Don) Florin: details of a twig

Fig. 12.15d: *Pilgerodendron uviferum* (D. Don) Florin: branch

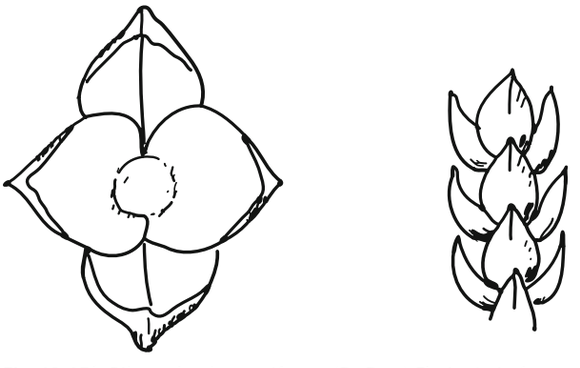


Fig. 12.15f: *Pilgerodendron uviferum* (D. Don) Florin: twig from above and side view

Pinus L.

Evergreen trees or shrubs; *branches* regularly whorled. *Twigs* of two kinds: long shoots with scale-like leaves, and short shoots bearing needle-like leaves in clusters of 2–5(–8). *Male cones* catkin-like, in clusters at the base of the young twigs. *Female cones* ripening in the second or third year, cylindrical or ovoid, usually falling in their entirety; *ovuliferous scales* woody, usually with a prominent protuberance (umbo), generally ending in a spine or prickle; *bracts* minute.

Pinus is one of the most widespread genera. Native to the northern hemisphere, several of its species reproduce profusely, becoming invasive, above all in the southern hemisphere (e.g. *Pinus pinaster*). (See GISD.)

Key to the *Pinus* of Patagonia

1.	–	Short shoots with bundles of **5** needle-like leaves	→ 2
	–	Short shoots with bundles of **2–3** needle-like leaves	→ 5
2.	–	Leaves triangular in cross-section, bluish-grey; cones ovoid, 5–8 cm long, erect	→ *P. cembra*
	–	Leaves slender, not triangular in cross-section, not bluish-grey; cones cylindrical, 8–50 cm long, pendent	→ 3
3.	–	Leaves finely denticulate towards the apex	→ *P. monticola*
	–	Leaves *without* discernible tiny teeth towards the apex	→ 4
4.	–	Cones 30–50 cm long, broad-cylindrical, long stalked; seeds 1.5 cm long (with wing, 3.5 cm), edible	→ *P. lambertiana*
	–	Cones 8–20 cm long, slender-cylindrical, often curved near apex; seeds 0.5–0.8 cm long (with wing, 1.8–2.2 cm)	→ *P. strobus*
5.	–	Leaves mainly in groups of **3**, rarely mixed with groups of 2	→ 6
	–	Leaves mainly in **pairs,** rarely mixed with groups of 3	→ 8
6.	–	Cones very asymmetrical, turned backwards, sessile or very shortly stalked; leaves with smooth apices, *not* pungent	→ *P. radiata*
	–	Cones mostly symmetrical, subsessile; leaves rigid, stingy	→ 7
7.	–	Buds conical, almost without resin; scales of buds with free tips; young twigs blue-grey; scales of open cones, rigid	→ *P. jeffreyi*
	–	Buds cylindrical, resinous; scales of buds appressed; young twigs red-brown; scales of open cones, flexible	→ *P. ponderosa*
8.	–	Cones bent backwards (reflexed)	→ 9
	–	Cones *not* bent backwards	→ 10
9.	–	Cones 3–8 cm long; leaves 2.4–8 cm long, twisted, sharply pointed, rigid	→ *P. contorta*
	–	Cones 8–10 cm long; leaves 6–10 cm long, very slender, flexible	→ *P. halepensis*
10.	–	Leaves 10–20 cm long	→ 11
	–	Leaves 3–7 cm long	→ 12
11.	–	Cones symmetrical, ovoid to globose, 8–15 (20) cm long, with scales getting wider towards their apex; seeds 15–20 mm, with broad short wing; leaves slightly twisted, 1.5–2 mm thick, flexible to slightly stiff	→ *P. pinea*
	–	Cones very asymmetrical at base, ovoid-conical, 8–20 cm long; seeds 7–8 mm, up to 40 mm with wing; leaves 2 mm thick, stiff, spiny	→ *P. pinaster*
12.	–	Leaves 4–7 cm long, blue-green, border smooth, apex pointed; cones more or less symmetrical, 3–6 cm long, pendent	→ *P. sylvestris*
	–	Leaves 3–4 cm long, bright green, border finely denticulate; cones asymmetrical, 2–7 cm long, on the sun-exposed side, scales often with a prominent, hooked or rounded umbo	→ *P. uncinata*

Pinus cembra L.
E: Arolla pine, Swiss stone pine, cembra-pine
Sp: Pino cembra
Fam.: Pinaceae

Fig. 12.16a: *Pinus cembra* L.: shape [El Bolsón]

Fig. 12.16c: *Pinus cembra* L.: **c:** branch

Evergreen, monoecious tree, up to 25 (40) m tall; *crown* conical-columnar, very dense. *Buds* resinous. *Bark* grey-brown, scaly. *Leaves* needle-like, in bundles of 5, 4–8 (12) cm long, thick, triangular, bluish-grey on the inner side. *Female cones* ovoid, 5–8 cm long, usually not opening on the tree; seed-scales often slightly reflexed. *Seeds* up to 14 mm long, wingless, thick.– Fl. 10–11. Fr. (mature cones) 3–8.

Status and distribution: Introduced; native to the central European Alps and Carpathians, from 1500–2800 m. *Habitat:* Acid soils; sub-alpine, cold climates. In *Patagonia,* at present mainly of ornamental value.

Hardiness: –28° C.

Use:

a. Wood: Very appreciated for furniture in alpine regions.

b. In medicine: See entry in *Picea*. *P. cembra* also contains pinocembrin, a minor flavonoid with antimicrobial activity.

Fig. 12.16b: *Pinus cembra* L.: bark

Fig. 12.16d: *Pinus cembra* L.: branch with male cones

Fig. 12.16e: *Pinus cembra* L.: short shoot with bundles of 5 leaves

Fig. 12.16f: *Pinus cembra* L.: female cone

Fig. 12.17c: *Pinus contorta* Douglas ex Loudon: twig

Fig. 12.17d: *Pinus contorta* Douglas ex Loudon: needles

Pinus contorta Douglas ex Loudon
Syn.: *Pinus bolanderi* Parl., *Pinus murrayana* Balf
E: Shore pine, lodgepole pine, beach pine, Tamarack pine
Sp: Pino murrayana, pino de playa
Fam.: Pinaceae

Fig. 12.17a,b: *Pinus contorta* Douglas ex Loudon: **a:** shape [Villa Simpson, Chile]; **b:** bark

Evergreen, monoecious tree, up to 10 m tall; *crown* narrow, conical, with short branches. *Bark* less than 2 cm thick, orange-brown to grey, with small scales. *Buds* cylindrical, acuminate, reddish, resinous. *Leaves* needle-like, in groups of 2, 2.4–8 cm, twisted, rigid, sharply pointed, dark green to yellowish green. *Female cones* ovoid, 3–6 cm long, reflexed (bent backwards), staying on the tree for 10–20 years. *Seeds* winged, 4–5 mm (10–20 mm with wing).– Fl. 10–11. Fr. (mature cones) 3–8.

Status and distribution: Introduced; native to western Canada and western USA, down to southern California; from 0–3500 m.

Habitat: Most productive on moist soils, rich in nutrients; temperate climates.

Hardiness: –20° C.

Uses: Wood soft and light, used mainly to produce paper. In *Patagonia,* some plantations; besides, in alleys and public places.

Fig. 12.17e: *Pinus contorta* Douglas ex Loudon: cones

Fig. 12.18b: *Pinus halepensis* Mill.: bark

Pinus halepensis Mill.

Syn.: *Pinus abasica* Hort. ex Carrière, *Pinus arabica* Sieber ex Spreng., *Pinus persica* Strang
E: Aleppo pine, Jerusalem pine
Sp: Pino de Alepo, pino carrasco, pino blanco, pino blanquillo, pino carrasqueño, pino de Jerusalén
Fam.: Pinaceae

Fig. 12.18a: *Pinus halepensis* Mill.: shape [Choele Choe, Villa Regina]

Evergreen, monoecious tree, up to 15 (20) m tall; *crown* rounded or irregular, conical when young. *Bark* smooth, ash-grey or whitish, becoming red-brown and fissured with age. *Buds* ovoid, non-resinous, scales ciliate, with free apices. *Shoots* silvery-grey during first season. *Leaves* needle-like, in groups of 2, 7–12 cm long, very slender, flexible, pale green. *Female cones* ovoid-conical, stalked, 6–12 cm long, often bent backwards to stem. *Seeds* winged, 5–8 mm (30 mm with wing).

Status and distribution: Introduced; native around the Mediterranean basin, mainly in the western part; from 0–1500 m.

Habitat: Prefers limestone and dolomite soils; temperate-warm climates, with winter rain and dry summers; drought-resistant.

Hardiness: –12° C.

Uses: Wood resinous, of poor quality: rough constructions, railway sleepers, telephone poles. Formerly, the trees were tapped for resin, and the bark was used for tanning leather. Furthermore, it is used for fuel. In *Patagonia,* mostly ornamental.

Remark: See **Fig. 12.18f** for a comparison of needles and cones of *P. halepensis, P. pinaster* and *P. pinea,* respectively.

Fig. 12.18c: *Pinus halepensis* Mill.: branch

Fig. 12.18d: *Pinus halepensis* Mill.: needles

Fig. 12.18e: *Pinus halepensis* Mill.: branch with cones

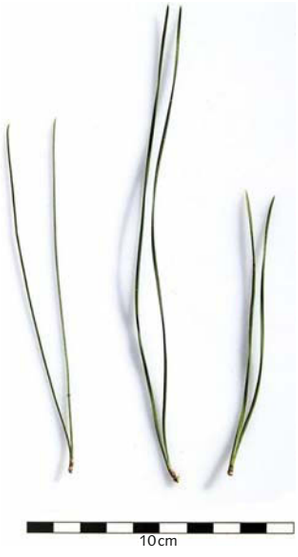


Fig. 12.18f: Comparison: *P. halepensis* Mill., *P. pinaster* Aiton, *P. pinea* L. from left to right: needles

Fig. 12.18g: Comparison: *P. halepensis* Mill., *P. pinaster* Aiton, *P. pinea* L. from left to right: cones

Pinus jeffreyi Grev. et Balf.
Syn.: *Pinus deflexa* Torr., *Pinus ponderosa* subsp. *jeffreyi* (Balfour) Murray, *Pinus ponderosa* var. *jeffreyi* (Balfour) Vasey
E: Jeffrey pine, Jeffrey's pine
Sp: Pino de Jeffrey
Fam.: Pinaceae

Evergreen, monoecious tree, up to 30 (60) m tall; *crown* conical in young specimens, turning into a cylindrical, open shape with a flat top in mature individuals. *Young twigs* blue-grey. *Bark* grey-brown, with deep reddish fissures and narrow plates. Bark fissures and newly exposed bark areas may emanate a scent described as vanilla, pineapple or banana. *Buds* conical, almost without resin, the tips of the scales free, pointing outwards. *Leaves* needle-like, in bundles of 3, 12–25 cm long, undulated from the sheaths upwards. *Male cones* yellow, sometimes tinged with purple, but not red as in *P. ponderosa*. *Female cones* ovoid-oblong, 15–30 cm long and 10–12 across; scales with mucronate *prickles (umbos)* bent backwards.The basal scales remain on the shoot. *Seeds* winged, 10–15 mm long (30–35 mm including wing).

Status and distribution: Introduced; native to western North America, from the Southwest of Oregon to Sierra San Pedro Martir of Baja California (Mexico). In *Patagonia,* occasionally in plantations of *P. ponderosa,* and, ornamental, in public places.

Habitat: Neutral soils; regions with long, cold winters and moderate summer temperatures. *Hardiness:* –24° C.

Uses:

a. Wood: P. jeffreyi's wood is used as that of *P. ponderosa;* in commerce, no distinction is made between these species.

b. In medicine: P. jeffreyi produces heptane, which was used against diseases affecting the lungs.

Remarks: See **Fig. 12.22 and the annex to the description of *P. ponderosa*** for illustrations of *P. jeffreyi* and the traits that enable us to distinguish between *P. jeffreyi* and *P. ponderosa*.

Pinus lambertiana Dougl.
E: Big pine, great sugar pine, sugar pine
Sp: Pino de azúcar
Fam.: Pinaceae

Fig. 12.19a,b: *Pinus lambertiana* Dougl.: **a:** branch with cone; **b:** bark

Evergreen, monoecious tree, up to 60 (75) m tall, with an open *crown* of long, tapering branches that arch upwards in the upper crown and spread horizontally below. *Buds* ovoid, acute, resinous. *Bark* light-brown, in parts reddish, deeply fissured in old age. *Leaves* needle-like, in bundles of 5, 5–10 cm long, slender, dark-green; the sheath scales shed during first season. *Female cones* terminal, hanging, with long peduncles, reaching 56 cm of length, most commonly 40–45 cm long. *Seeds* winged, 9–18 mm (to 35 mm with wing), edible.

Status and distribution: Introduced; native to western USA and north-western Mexico, from 350 to 3200 m of altitude.

Habitat: Mountainous zones, soils mildly acid; wet winters, dry summers.

Hardiness: –16° C.

Uses: Wood appreciated for heavy and light construction, also for musical instruments. The seeds provided food for Indian tribes in Oregon and California. In *Patagonia,* mainly of ornamental value.

Remark: See the comparison between *P. lambertiana* and *P. strobus* (**Fig. 12.19f,g**).

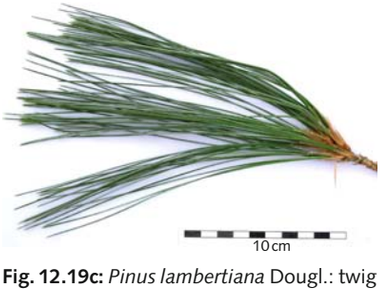


Fig. 12.19c: *Pinus lambertiana* Dougl.: twig

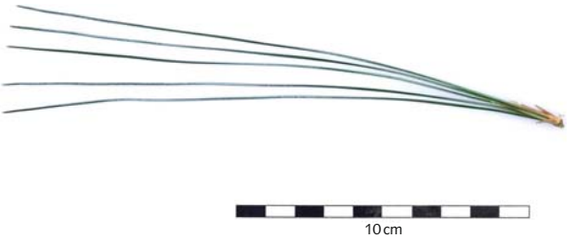


Fig. 12.19d: *Pinus lambertiana* Dougl.: short shoot with needles

Fig. 12.19e: *Pinus lambertiana* Dougl.: cone

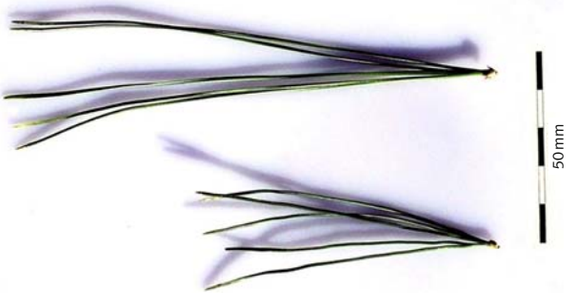


Fig. 12.19f: Comparison: *P. lambertiana* (above) and *P. strobus* (below): needles

Fig. 12.19g: Comparison: *P. lambertiana* (above) and *P. strobus* (below): cones

Pinus pinaster Aiton

Syn.: *Pinus maritima* Lam., *Pinus hamiltonii* Ten
E: Maritime pine, cluster pine
Sp: Pino marítimo, pino gallego, pino negral, pino resinero
Fam.: Pinaceae

Fig. 12.20a,b: *Pinus pinaster* Aiton: **a:** shape; **b:** bark

Evergreen, monoecious tree, up to 35–40 m tall, *crown* wide and flat. *Bark* dark red-brown, thick, deeply fissured. *Buds* large, without resin, the scales having free, arched apices. *Leaves* needle-like, in groups of 2, 10–25 cm long, stiff, spiny, finely denticulate, with a vivid green colour; the basal *sheaths* grey-black. *Female cones* wide, ovoid-conical, 8–22 cm long, very asymmetric at their base; scales with a prominent, spiny umbo. *Seeds* winged, 7–8 mm (to 40 mm with wing). Fl. 7–8. Fr. 3–4.

Status and distribution: Introduced; native to the Mediterranean regions of southern France, Corsica, Sardinia, Italy, Spain, and from Morocco to Tunis; also in the Atlantic coast of Portugal, Spain, and France. Extensively cultivated on the coastal dunes of the central provinces of Chile.

Fig. 12.20c: *Pinus pinaster* Aiton: branch

Habitat: Prefers sandy, silicate soils near the coast; warm, temperate regions with an oceanic influence.

Hardiness: -4° C.

Uses: Very resinous wood, used for construction, furniture, poles; in France, resin is extracted from the wood. In *Argentine Patagonia*, mostly ornamental.

Remarks: See **Fig. 12.18f** for a comparison of needles and cones of *P. halepensis, P. pinaster* and *P. pinea,* respectively.

P. pinaster can become an invasive species.

Fig. 12.20d: *Pinus pinaster* Aiton: short shoot

Fig. 12.20e: *Pinus pinaster* Aiton: cones

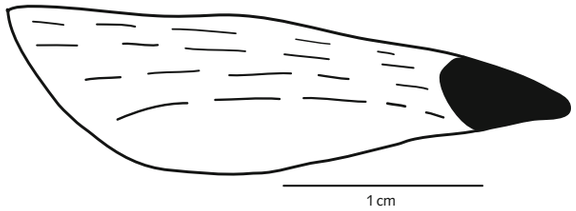


Fig. 12.20f: *Pinus pinaster* Aiton: seed (after Dimitri (1982), modified; draughtsman: E.M. Castellanos; with the permission of the INTA.)

Pinus pinea L.

Syn.: *Pinus domestica* Matthews, *Pinus sativa* Lam
E: Stone pine, umbrella pine, Italian stone pine
Sp: Pino piñonero, pino piñón, piñonero, pino parasol, pino
Fam.: Pinaceae

Fig. 12.21a: *Pinus pinea* L.: shape [Los Antiguos]

Evergreen, monoecious tree, up to 15–25 (30) m tall; *crown* broad, umbrella-like; in young specimens, rounded. *Bark* grey and orange-brown, very thick, deeply fissured, with thick plates falling off, discovering cinnamon-coloured internal scales. *Buds* ovate-acute, without resin. *Leaves* needle-like, in bundles of 2, 8–12 (-20) cm, from flexible to somewhat stiff, slightly twisted, finely serrate, pungent, light green. *Female cones* ovoid to globose, 8–15 (20) cm long, sessile, with scales getting wider towards their apex. *Seeds* 15–20 mm, edible, with a broad, rudimentary wing.

Status and distribution: Introduced; native to the Mediterranean region.

Habitat: Sandy soils near the coast; a thermophile and xerophile species.

Fig. 12.21b: *Pinus pinea* L.: bark

Hardiness: –20° C.

Uses: Wood very resinous, construction, containers, carpentry. Seeds (pine kernel or pine nut) much appreciated in Mediterranean cooking. Bark used for tannin extraction. In *Patagonia,* mainly ornamental.

Remark: See **Fig. 12.18f** for a comparison of needles and cones of *P. halepensis, P. pinaster* and *P. pinea,* respectively.

Fig. 12.21c: *Pinus pinea* L.: branch

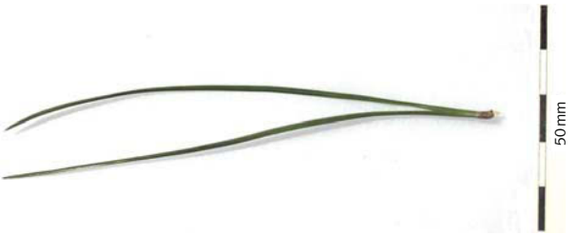


Fig. 12.21d: *Pinus pinea* L.: short shoot

Fig. 12.21e: *Pinus pinea* L.: cone

Fig. 12.21f: *Pinus pinea* L.: seed (after Dimitri (1982) fig. 44, and Schütt, modified)

Fig. 12.22b: *Pinus ponderosa* Douglas ex Lawson & C. Lawson: bark

Pinus ponderosa Douglas ex Lawson & C. Lawson
Syn.: *Pinus brachyptera* Engelm., *Pinus scopulorum* (Engelm.) Lemmon
E: Ponderosa pine
Sp: Pino amarillo occidental americano, pino ponderosa, pino real americano, pino amarillo de las rocosas
Fam.: Pinaceae

Fig. 12.22a: *Pinus ponderosa* Douglas ex Lawson & C. Lawson: shape [Bariloche]

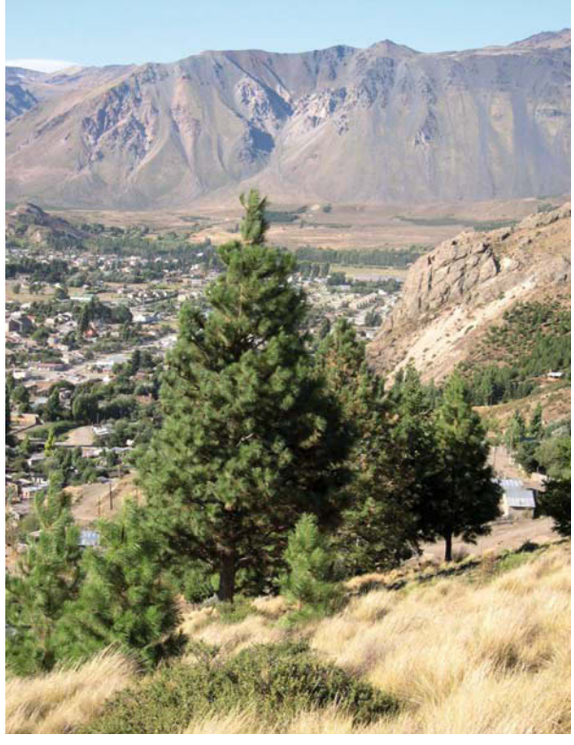


Fig. 12.22c: *Pinus jeffreyi* Grev. et Balf.: shape [Esquel]

Evergreen, monoecious tree, up to 40 (60) [75] m tall; *crown* narrow and conical when young, becoming broader, irregular, and obtuse with age. Upper *branches* ascendent, lower ones drooping; *shoots* red-brown during the first season. *Buds* cylindrical, bud scales appressed, resinous. *Bark* grey when young, later becoming orange-brown, with deep reddish fissures and large, flat plates. *Leaves* needle-like, in bundles of 3, 12–25 cm long, straight, edges finely serrate, apices pungent, yellow-green. *Male cones* red or purplish when young. *Female cones* ovoid, 8–15 cm long; scales with mucronate-erect *prickles.* The basal scales remain attached to the shoot. *Seeds* winged,

Fig. 12.22d: *Pinus jeffreyi* Grev. et Balf.: bark

Traits separating *P. ponderosa* and *P. jeffreyi*

Character	***P. ponderosa***	***P. jeffreyi***
young twigs	red-brown	blue-grey
buds	cylindrical, scales appressed, resinous	conical, scales with free tips, without resin
leaves	straight, rigid	undulated at base
female cones	scales with prickles bent to the apex	scales with prickles bent backwards
bark	emanating a vanilla-banana scent	with little or no odour

Fig. 12.22e: *Comparison*: *P. ponderosa* (left), *P. jeffreyi* (right): cones

Fig. 12.22f: *Comparison*: *P. ponderosa* (left), *P. jeffreyi* (right): cones

7–10 mm (23–28 including wing).– Fl. 11. Fr. (mature cones) 3–8.

Status and distribution: Introduced; native to south-western Canada, western USA, and to the Northwest of Mexico. In *Patagonia,* very extensive plantations in the zones of transition between the humid Andean-Patagonian forests and the arid steppe.

Habitat: Best growth on slightly dry soils.

Hardiness: –24° C.

Uses: The wood is dense (about 450 kg per cubic metre) and has many uses, especially in construction and carpentry.

Remark: P. ponderosa is often not clearly distinguished from *P. jeffreyi,* a species with which it hybridizes. For a comparison, see the following paragraph.

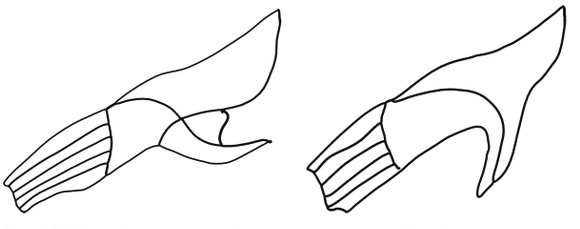


Fig. 12.22g: *Comparison*: *P. ponderosa* (left), *P. jeffreyi* (right): umbos

Fig. 12.22h: Comparison: *P. ponderosa* (left), *P. jeffreyi* (right): branches

Fig. 12.22i: Comparison: *P. ponderosa* (left), *P. jeffreyi* (right): short shoots

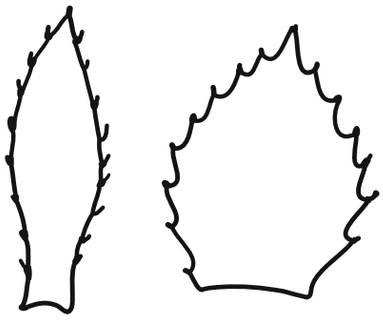


Fig. 12.22k: Comparison: *P. ponderosa* (left), *P. jeffreyi* (right): buds.

Pinus radiata D. Don

Syn.: *Pinus insignis* Douglas ex Loudon, *Pinus muvicata* var. *cedrosensis* J.T. Howell
E: Radiata pine, insignis pine, remarkable pine, radiata, Monterey pine
Sp: Pino radiata, pino insignia, radiata, pino insigne, pino de Monterrey
Fam.: Pinaceae

Fig. 12.23a,b: *Pinus radiata* D. Don: **a:** shape [Comodoro Rivadavia]; **b:** bark

Evergreen, monoecious tree, up to 30 m tall; *crown* irregular, with a complex, variable branching pattern. *Buds* ovoid-cylindrical, resinous. *Bark* dark brown, rather thick, deeply fissured. *Leaves* needle-like, in bundles of 3, 8–15 (18) cm long, slender, deep green, finely serrate, rigid but with smooth apices that do not sting. *Female cones*

Fig. 12.23c: *Pinus radiata* D. Don: branch

asymmetric, ovoid-conical, shortly pedunculate, 7–14 cm long, bent backwards. *Seeds* winged, 6 mm (20–25 mm with wing).

Status and distribution: Introduced; it occurs naturally just on three discrete populations on the Californian mainland (e.g. Monterey, to the South of San Francisco), and on the islands of Guadalupe and Cedros, off the coast of Baja California (Mexico); from 0 to 300 m. Extensive plantations in Chile, New Zealand, Australia, Argentina, Spain, etc. In Chile, especially on the coastal areas between the Regions VII and X.

Habitat: Zones of mild, oceanic climate, with sea fogs during rainless summer months.

Hardiness: –12° C.

Uses: Wood of medium quality, very versatile: used for constructions, furniture, paper pulp. In *Argentine Patagonia,* several plantations, but also ornamental, in alleys and public grounds.

Fig. 12.23f: *Pinus radiata* D. Don: cone

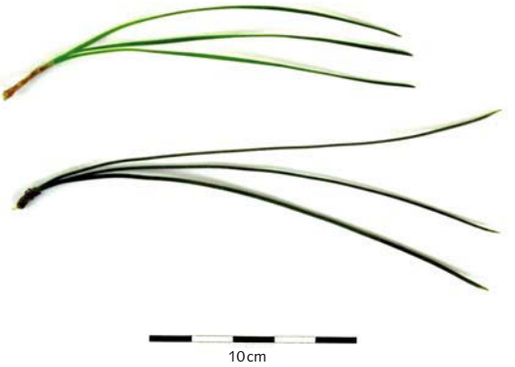


Fig. 12.23d: *Pinus radiata* D. Don: short shoot

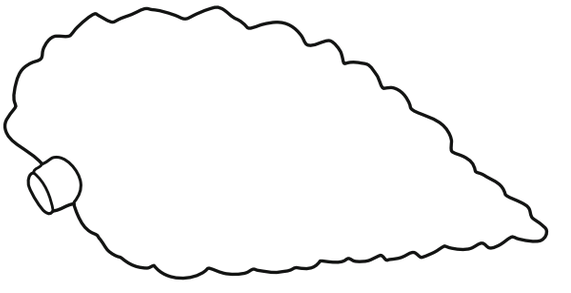


Fig. 12.23g: *Pinus radiata* D. Don: diagram of an asymmetrically placed cone

Fig. 12.23e: *Pinus radiata* D. Don: reflexed cone on branch

Fig. 12.23h: *Pinus radiata* D. Don: vegetative buds

Pinus strobus L.
E: Eastern white pine, Weymouth pine
Sp: Pino blanco
Fam.: Pinaceae

Fig. 12.24a,b: *Pinus strobus* L.: **a:** shape [Esquel]; **b:** bark

Evergreen, monoecious tree, up to 50 m tall, *crown* conical, with regular whorls of branches, quite open. *Buds* slightly resinous. *Bark* grey-brown, thick and deeply furrowed. *Leaves* needle-like, in bundles of 5, 5.5–12 cm long, slender, lax but *not* drooping, bluish-green with pale grey-white lines on inner surface; the sheath scales shed during first season. *Female cones* pendant, slim, cylindrical, 8–20 cm long, often curved towards the apex, marked with white resin. *Seeds* winged, 5–8 mm (18–25 mm with wings).– Fl. 11. Fr. (mature cones) 3–8.

Status and distribution: Introduced; native to north-eastern USA, and eastern Canada, from 600–1500 m.

Habitat: Prefers sandy, loamy soils; cool and humid climates.

Fig. 12.24c1: *Pinus strobus* L.: branch

Fig. 12.24c2: *Pinus strobus* L.: branch

Uses: Light, soft wood, with many uses in carpentry and construction. In *Patagonia,* mainly of ornamental value.

Hardiness: –32° C.

Remark: P. strobus is often mistaken for *P. monticola* Douglas ex Don, a western North American species. A characteristic trait distinguishing *P. monticola* can be found in its needles which are finely denticulate toward the apex.– See also the comparison between *P. lambertiana* and *P. strobus* (**Fig. 12.19f,g**).

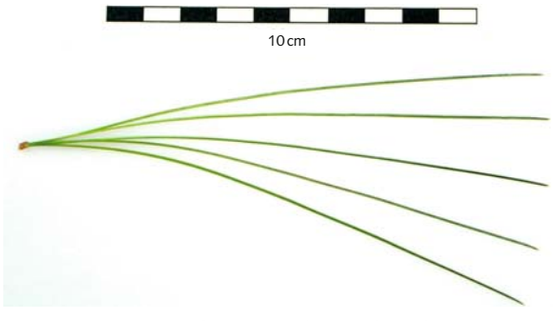


Fig. 12.24d: *Pinus strobus* L.: short shoot

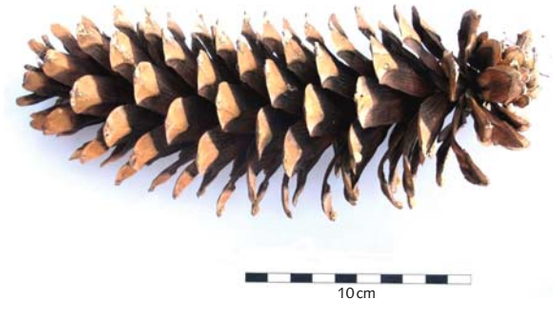


Fig. 12.24e: *Pinus strobus* L.: cone

Fig. 12.24f: *Pinus monticola* Douglas ex Don: branch

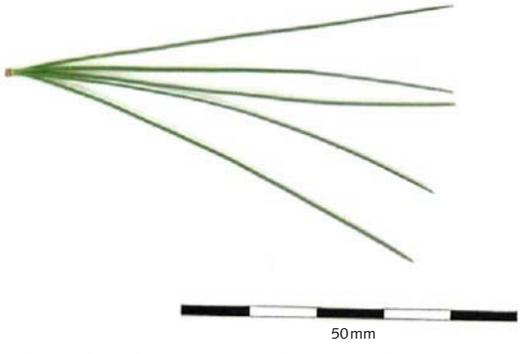


Fig. 12.24g: *Pinus monticola* Douglas ex Don: short shoot

Fig. 12.24h: *Pinus monticola* Douglas ex Don: cones

Pinus sylvestris L.

Syn.: *Pinus densiflora* f. *sylvestriformis* Taken
E: Scots pine
Sp: Pino albar, pino de Valsaín, pino silvestre
Fam.: Pinaceae
(†)

Fig. 12.25a,b: *Pinus sylvestris* L.: **a:** shape [Trevelin]; **b:** bark

Evergreen, monoecious tree, up to 30 (40) m tall; *crown* rounded, flattened or irregular, conical when young. *Bark* orange or reddish-brown in the upper parts, where thin scales come off. *Buds* ovoid, elongate, feebly resinous. New *shoots* greenish, grey-brown in the second season. *Leaves* needle-like, in groups of 2, 2.4–7 cm long, bluish-green. *Female cones* conical or ovoid-conical, shortly pedunculate, 3–7 cm long. *Seeds* winged, 3–4 mm (15–20 mm with wing).– Fl. 11. Fr. (ripe cones) 3–8.

Status and distribution: Introduced; native to Eurasia, from Scotland and Spain to Mongolia, from 0–1900 m. The pine with the greatest natural distribution; it is a variable species, with more than 50 botanical varieties having been described.

Fig. 12.25c: *Pinus sylvestris* L.: branch, with young female, red cones at the end of a new long shoot (2008), yellow male cones, equivalent to short shoots, and an unripe female cone which had "flowered" a year earlier (2007)

Fig. 12.25d: *Pinus sylvestris* L.: short shoots

Fig. 12.25f: *Pinus sylvestris* L.: female cone

Habitat: Occurs often on very poor soils with little competition from other species; does neither grow on soils with permafrost nor in regions where the temperature amplitude is more than 40° C.

Hardiness: –36° C.

Uses:

a. Wood: It is used for a large variety of applications: construction, furniture, musical instruments, paper pulp, etc. In *Patagonia,* some plantations; besides, a species of ornamental value.

b. In medicine: The pollen contains androstenedione and testosterone, phytosterols with androgenic activity. The essential oils from the needles contain the monoterpenoids bornyl acetate, an expectorant, and car-3-ene, an irritant. The oils are also used to treat neuralgia and rheumatism. TEM.

Remark: The resin is slightly poisonous; it can cause cutaneous irritations.

Fig. 12.25e: *Pinus sylvestris* L.: male cones

Pinus uncinata Ramond ex DC.

Syn.: *Pinus mugo* Turra, sensu lato; *P. mugo* ssp. *uncinata* (DC.) Domin; *P. mugo* ssp. *uncinata* (Ramond) Domin; *P. uncinata* Miller ex Mirbel

E: Mountain pine

Sp: Pino negro, pino moro, pino de montaña

Fam.: Pinaceae

Fig. 12.26a,b: *Pinus uncinata* Ramond ex DC.: **a:** shape [Perito Moreno]; **b:** bark

Evergreen tree, up to 25 m tall with a conical *crown*. *Bark* greyish, with reddish fissures. *Branches* ascending or erect; *twigs* green at first, turning brown; *buds* ovoid-cylindrical, very resinous. *Leaves* needle-like, in groups of 2, slightly arched, 3–8 cm long and 1.5–2 mm across, dark green. *Female cones* sub-sessile, asymmetric, 5–7 cm long and 2–3 cm across; umbo eccentric and mucronate, often forming a hook, on the sun-exposed side of the cone.

Status and distribution: Introduced; native to mountains of central and southern Europe. In *Patagonia,* above all ornamental in southern towns (e.g. Perito Moreno, Prov. Santa Cruz).

Hardiness: –24° C.

Uses: Wood is used for fencing, pallets, and packaging.

Fig. 12.26c: *Pinus uncinata* Ramond ex DC.: twig

Fig. 12.26d: *Pinus uncinata* Ramond ex DC.: short shoot

Fig. 12.26e: *Pinus uncinata* Ramond ex DC.: cones on twig

Remark: P. uncinata tends to hybridize with *P. mugo* Turra, mountainous small trees or shrubs, rarely taller than 5 m. It can also form hybrids with *P. sylvestris.*

Fig. 12.26f: *Pinus uncinata* Ramond ex DC.: cone

Podocarpus nubigenus Lindl.

Syn.: *Podocarpus nubigena* Lindl.
E: Chilean podocarp
Sp: Maniú macho, mañío, mañiú, mañío de hojas punzantes, pino amarillo, mañío hembra (en Chiloé), pino huililahuán, mañío de la costa, mañío de hojas picantes, mañihual, mañihues
Fam.: Podocarpaceae

Fig. 12.27a: *Podocarpus nubigenus* Lindl.: shape [PN El Alerce Andino]

Fig. 12.27b: *Podocarpus nubigenus* Lindl.: twig

Evergreen, dioecious tree, up to 25 m tall; *crown* pyramidal at first, becoming irregular with age. *Bark* dark greyish, with scales and longitudinal fissures. *Leaves* alternate, single, linear-lanceolate, (1.5) 2–4 cm long, 3–4 mm wide, coriaceous, ending in a rigid, sharp point; dark green above, with two whitish stomatical bands beneath. *Male cones* axillary, amentaceous, 1.5–2.5 cm long; *female cones* axillary, solitary, subtended by a multi-scaled receptacle, only one seed-scale being fertile. *Seeds* ovoid, with a fleshy, red, edible, seed coat, 8–9 mm long. Fl. 12–1. Fr. 5–8.

Status and distribution: Native; in Argentina: CHU, NE, RN; mainly between Puerto Blest and Lago Frías; in Chile: from the Prov. of Cantín to Última Esperanza (Regions IX-XII).

Habitat: It grows on moist to wet, boggy soils. It associates with *Drimys winteri, Nothofagus betuloides* (in Chile), *N. nitida* (in Chile), *Fitzroya cupressoides, Pilgerodendron uviferum*.

Elevation: 100 (?)–1000 (?) m.

Hardiness: –16° C.

Uses: Light, resistant wood: for furniture, coatings, sport articles; important as an ornamental species. The fleshy seeds are edible.

Remark: See **Fig. 12.27g** for the comparison of the leaves of *P. nubigenus* and *Saxegothaea conspicua*.

Fig. 12.27c: *Podocarpus nubigenus* Lindl.: leaves

Fig. 12.27d,e: *Podocarpus salignus* D. Don: **d:** shape [Valdivia]; **e:** bark

Fig. 12.27f: *Podocarpus salignus* D. Don: twig

Fig. 12.27g: Comparison *P. nubigenus* and *Saxegothaea conspicua*: twigs of *Podocarpus* (left) and *Saxegothaea* (right)

Podocarpus salignus D. Don
Syn.: *Podocarpus saligna* D. Don
E: Willow-leaf podocarp
Sp: Mañiú, mañío, mañío de hojas largas, pino, pino blanco, pino de hojas largas
Fam.: Podocarpaceae

Evergreen, dioecious tree or shrub, up to 20 m tall. *Bark* red-brown to orange-brown, fissured longitudinally. *Branches* and *twigs* pendulous, giving the tree the appearance of a willow; *twigs* green. *Leaves* alternate, falcate or lanceolate, tapering to the apex, 8–12 cm long and 0.5–0.7 across, *upper side* glossy dark green, *underside* paler. *Seed* fleshy, about 8 mm across, surrounded by a peduncle, fleshy, deep red receptacle. Fl. 12–1. Fr. 3.

Status and distribution: Native to Chile, from the Rio Maule to the Province of Osorno, on the mountain chains as well as along the coast (Regions VII-X). Preferably on moist soils, near water courses, and in woody associations where *Nothofagus obliqua* is predominant.

Uses: Light, hard, yellow, and perfumed wood, used for furniture and for carving. Besides, an important ornamental species.

Remark: See **Fig. 12.27d–f.**

Pseudotsuga menziesii (Mirb.) Franco
Syn.: *Pseudotsuga douglasii* (Lindley) Carrière, *Pseudotsuga taxifolia* (Poir.) Britton
E: Douglas fir
Sp: Pino Oregón, abeto de Douglas
Fam.: Pinaceae

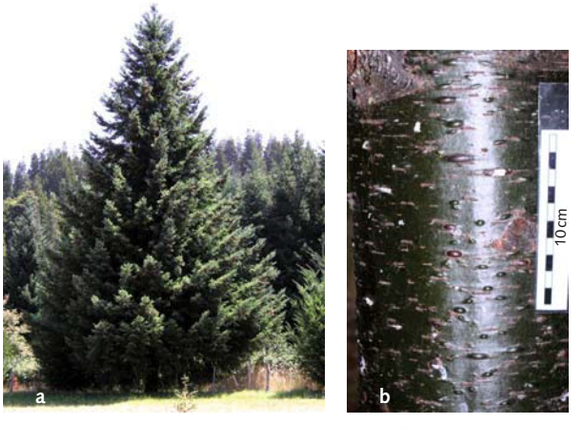


Fig. 12.28a,b: *Pseudotsuga menziesii* (Mirb.) Franco: **a:** shape [El Bolsón]; **b:** young bark with resinous vesicles

Fig. 12.28c: *Pseudotsuga menziesii* (Mirb.) Franco: twig

Fig. 12.28d: *Pseudotsuga menziesii* (Mirb.) Franco: branch with young cones

Evergreen, monoecious tree, up to 90 (100) m tall; *crown* broadly pyramidal, with widespread, nearly horizontal *branches. Bark* greyish, smooth, speckled with aromatic, resinous vesicles, becoming purple-brown and fissured with age. *Leaves* linear to needle-like, arranged spirally along the shoots, flattened, 2–3 cm long, soft, aromatic; the *upper side* light green, the *underside* with two white bands; *apex* acute or rounded. *Male cones* axillary, orange-yellow; *female cones* ovoid-conical, 5–11 cm long, drooping, chestnut-reddish, with very typical prominent trident bracts between the seed-scales. *Seed* 6 mm long, with a large wing.– Fl. 11. Fr. (mature cones) 3–4.

Status and distribution: Introduced; native to western North America, from British Columbia (Canada) to central California.

Habitat: From the coast upwards on usually moist mountain slopes of non-calcareous ground, to 1800 m in the south. In *Patagonia,* large plantations; the species has also ornamental value. It can be invasive in certain areas.

Hardiness: –24° C.

Uses: The wood is used for furniture, decorative work, veneers, construction, piling, and packaging.

Fig. 12.28e: *Pseudotsuga menziesii* (Mirb.) Franco: cones on twig

Fig. 12.28f: *Pseudotsuga menziesii* (Mirb.) Franco: mature cones

Saxegothaea conspicua Lindl.

Syn.: *Saxe-gothaea conspicua* Lindl., *Squamataxus albertiana* J. Nelson
E: Prince Albert's yew
Sp: Maniú hembra, mañio hembra, mañio, mañiú, mañíu, mañio de hojas cortas, mañio macho (en Chiloé), mañio-lahuán, mañihual, mañihues
Fam.: Podocarpaceae

Fig. 12.29a,b: *Saxegothaea conspicua* Lindl.: **a:** shape [PN Lanín]; **b:** bark

Evergreen, monoecious tree, up to 15 (20) m tall, with a broad, luxuriant *crown*. *Bark* thin, with large violet-red plates. *Leaves* alternate-distichous, linear-falcate, 1–3 cm long, *upper side* dark green, *underside* with two whitish bands, *apex* with a moderately pungent mucro. *Male cones* axillary, ovoid-amentaceous, to 6 mm long; *female cones* at the tip of the shoot, pedunculate, globose, 1–2 cm in diameter, consisting of overlapping, pointed green scales. *Seeds* ovoid, smooth, 3–4 mm long. Fl. 11–12. Fr. 1–2.

Status and distribution: Native; in Argentina: CHU, NE, RN, particularly around Puerto Blest; in Chile: from the south of Río Maule to the province of Aisén, and in the province of Valdivia (Regions VII-XI).

Habitat: It grows in humid regions with a high annual rainfall (more than 2000 mm). It accompanies *Nothofagus dombeyi, Drimys winteri, Weinmannia trichosperma, Eucryphia cordifolia, Laureliopsis philippiana*.

Elevation: 800–1000 m.

Hardiness: –8° C.

Uses: Wood pink to yellow, smooth; it neither distorts itself nor does it receive cracks which changes of humidity: used for fine furniture, poles, and barrel-making.

Remark: Saxegothaea is able to regenerate and spread from root sprouts.– See **Fig. 12.27g** for the comparison of the leaves of *P. nubigenus* and *Saxegothaea conspicua*

Fig. 12.29c: *Saxegothaea conspicua* Lindl.: twig, underside

Fig. 12.29d: *Saxegothaea conspicua* Lindl.: twig with female cone

Fig. 12.30c: *Sequoia sempervirens* (D. Don) Endlicher: twig, underside

Sequoia sempervirens (D. Don) Endlicher
E: California redwood, coast redwood
Sp: Sequoia, secuoya, secoya, leño rojo de California
Fam.: Taxodiaceae

Fig. 12.30a,: *Sequoia sempervirens* (D. Don) Endlicher: **a:** shape [Hillier, UK]; **b:** bark

Fig. 12.30d: *Sequoia sempervirens* (D. Don) Endlicher: twig, upper side

Evergreen, monoecious tree, up to 110 m tall; *crown* pyramidal, with extended, somewhat drooping branches. *Bark* red-brown, soft, peeling off in irregular flakes that disclose new reddish plaques. *Leaves* of two types: on *young lateral twigs*, distichous (two-ranked), linear-lanceolate, slightly falcate, 0.6–3 cm long and 2 mm across, the *upper side* dark green, the *underside* with two whitish bands; on *old and long branches,* scale-like, lanceolate, all around the shoot and somewhat appressed. *Male cones* solitary or axillary, ovoid, yellowish; *female cones* ovoid or sub-globose, 1–3 cm long, red-brown when ripe. *Seeds* 4–5 mm long, with a narrow wing.

Status and distribution: Introduced; native to South Oregon and California, growing on low slopes in coastal regions. In *Patagonia,* ornamental. *Hardiness:* –16° C.

Remark: Unlike most conifers, *S. sempervirens* can regenerate from root sprouts.

Uses:

a. Wood: For construction, domestic and industrial uses, fencing, packaging.

b. In medicine: The cones of *S. sempervirens,* as well as *Sequoiadendron giganteum,* contain the phenol phloroglucinol which has antispasmodic activity.

Sequoiadendron giganteum (Lindl.) Buchholz
Syn.: *Sequoia gigantea* Decne, non Endl., *Sequoia wellingtonia* Seem
E: Wellingtonia, giant redwood
Sp: Secuoya gigante, árbol del mamut, secoya, secuoia
Fam.: Taxodiaceae

Fig. 12.31a: *Sequoiadendron giganteum* (Lindl.) Buchholz: shape, young tree [Los Antiguos]

Fig. 12.31b: *Sequoiadendron giganteum* (Lindl.) Buchholz: shape, mature tree [Belvoir Park, Zürich]

Fig. 12.31c: *Sequoiadendron giganteum* (Lindl.) Buchholz: bark

Fig. 12.31d: *Sequoiadendron giganteum* (Lindl.) Buchholz: twig

Evergreen, monoecious tree, up to 90 (100) m tall; *trunk* widened at the base, markedly conical; *crown* conical at first, opening itself with age. *Branches* slender, covered by the leaves. *Leaves* arranged spirally, scale-like to slightly needle-like, appressed to the shoot in their basal halves, 3–12 mm long, sharp-pointed, deep blue-green. *Male cones* terminal, solitary. *Female cones* green for many yeaxrs, ovoid or barrel-shaped, 5–9 cm long, seed-scales peltate, depressed in the middle and bearing a small, rounded umbo. *Seeds* 3–9 per scale, 4–7 mm long, with two wings.– Fl. 10–11.

Status and distribution: Introduced; native to California, along the western slopes of Sierra Nevada. In *Patagonia,* ornamental. *Hardiness:* –20° C.

Uses:

a. Wood: For fencing, gates, pellets, packaging.

b. In medicine: See entry in *Sequoia sempervirens.*

Fig. 12.31e: *Sequoiadendron giganteum* (Lindl.) Buchholz: cones

Taxus baccata L.

E: Common yew, English yew
Sp: Tejo, tejón
Fam.: Taxaceae
††

Fig. 12.32a,b: *Taxus baccata* L.: **a:** shape [Münchenstein, Switzerland]; **b:** bark

Evergreen, monoecious or dioecious tree or shrub, up to 15 (20) m tall; *crown* dense, richly branched. *Bark* purple-brown, smooth, flaking. *Shoot* of *twigs* green. *Leaves* alternate, often twisted at the base and arranged in two opposite ranks, linear or slightly falcate, 1–3 cm long and 1.5–2.5 mm across, the *upper side* dark green, shiny, the *underside* pale green, opaque. *Male cones* axillary, solitary, small; *female organs* axillary, solitary, formed of numerous

Fig. 12.32c: *Taxus baccata* L.: twig, underside

sterile basal scales and a single, terminal, erect ovule. *Seed* ovoid, 1 cm long, greenish, surrounded by a fleshy, bright red aril, through the opening of which the tip of the seed peeps out.– Fl. 9–10. Fr. 3–5.

Status and distribution: Introduced; native to northern Africa, Europe, south-western Asia, growing preferably on limey soils. In *Patagonia,* ornamental. *Hardiness:* –28° C.

Remarks: T. baccata can regenerate and spread from root sprouts.

Uses

a. Wood: Appreciated for turnery, cabinet making, decorative work, and for fencing, pallets, etc.

b. In medicine: T. baccata contains several toxic alkaloids (e.g. cephalomannine, taxine A, taxol). Cephalomannine has antileukaemic and antitumour activities.– Apart from the fleshy aril, the entire plant is very poisonous. MM.

Fig. 12.32d: *Taxus baccata* L.: twig, upper side

Fig. 12.32e: *Taxus baccata* L.: twig with seed, surrounded by fleshy arillus

Thuja orientalis L.

Syn.: *Platycladus orientalis* (L.) Franco

E: Chinese thuja, Chinese arbor-vitae, Oriental arbor-vitae

Sp: Tuya, árbol de la vida, tuya de la China, biota

Fam.: Cupressaceae

†††

Fig. 12.33a: *T. orientalis* L.: twig with cones

Evergreen monoecious shrub or tree, up to 12 m, often with several fairly vertical *stems* and a broad, pyramidal crown. *Bark* thin, reddish brown, separating into papery scales. *Twigs* flattened in *vertical* planes. *Leaves* scale-like, opposite and decussate, with acute, free tips; the *facial leaves* 1–1,3 mm long, with an elongated resinous gland in the middle; the *lateral leaves* slightly larger. *Male cones* terminal, solitary. *Female cones* 1.5–2.5 cm long, bluish before ripening, composed of 6–8 scales, with a comparatively thick, horn-shaped, dorsal umbo. *Seeds* wingless. – Fl. 10–11. Fr. (mature cones) 3–5.

Status and distribution: Introduced; native to China, Japan, and Korea. In *Patagonia,* ornamental.

Hardiness: –24° C.

Remarks: Thuja is a genus of 5 species, native to North America and far eastern Asia, respectively. In *Patagonia,* three species are cultivated, all of them ornamental:

***T. plicata* D. Don** (western red cedar) reaches up to 60 m of height. On the *underside* of its *horizontally* flattened *twigs* stand out the whitish bands of the leaves. The *female cones* lack a dorsal mucro, but end in an acute or pungent apex. *Seeds* surrounded by a wing.

***T. occidentalis* L.** (American arbor-vitae) has no white bands on the underside of its *horizontally* flattened

Fig. 12.33b: *T. occidentalis* L.: twig with cones

twigs. The *female cones* are oblong, of smooth scales, *pink* at the time of pollination. Both *T. occidentalis* and *T. plicata* are of North American origin.

Uses:

a. Wood: The wood of all *Thuja* species is used for construction, several domestic and industrial uses, fencing, packaging.

b. In medicine: Above all *T. plicata* and *T. occidentalis* contain monoterpenoids (e.g. β-thujaplicin, γ-thujaplicin) with antifungal activities. Extracts of *T. occidentalis* are also used to stimulate the immune system. TNAM.– All the parts of *T. orientalis* and *T. occidentalis* are extremely poisonous. *T. plicata* may cause allergic reactions.

Remark: See comparison of twigs and cones of *C. decurrens* and *Thuja orientalis* in **Fig. 12.33e**.

Fig. 12.33d: *T. plicata* D. Don: bark

Fig. 12.33e: Comparison: *T. orientalis* (below) vs. *Calocedrus decurrens* (above): twigs, underside

Fig. 12.33c: *T. plicata* D. Don: twig with cones

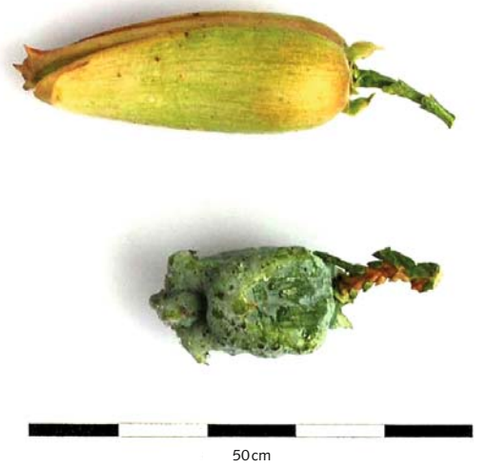


Fig. 12.33f: Comparison: *T. orientalis* (below) vs. *Calocedrus decurrens* (above): cones

13. Genera and species of dicots

Fig. 13.0: Lago Rivadavia (PN Los Alerces), South-exposed slope. In the lower areas, *Nothofagus dombeyi*; higher up the mountains, *Nothofagus pumilio*. (29.01.08, early afternoon)

Acacia dealbata Link

Syn.: *Acacia decurrens* var. *dealbata* (Link) F.v. Muell.
E: Silver wattle, mimosa
Sp: Aromo, acacia, acacia francesa, aromo francés, aromo del país, mimosa plateada, mimosa
Fam. Fabaceae (Mimosaceae)

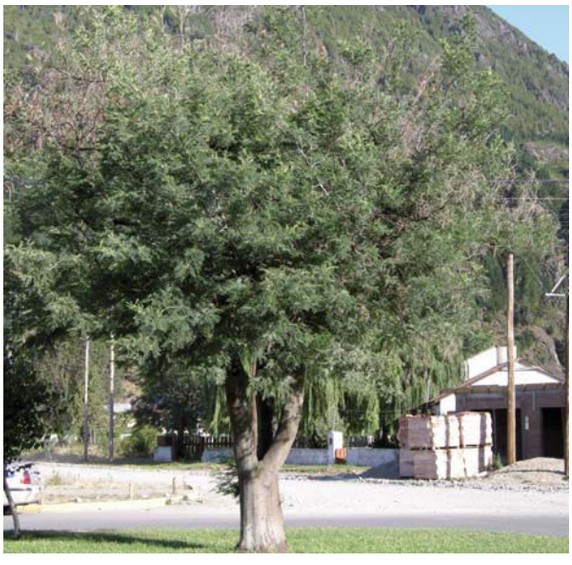


Fig. 13.1a: *Acacia dealbata* Link: shape [Lago Puelo]

Evergreen small tree, usually up to 15 m tall, with a broadly conical *crown*. *Twigs* angled and pubescent. *Leaves* alternate, bi-pinnate, 6–12 cm long, finely hairy, with 8–25 primary pinnae, with a gland between every pair, each pinna bearing 30–70 linear, un-toothed, blue-green leaflets. *Inflorescences* axillary panicles, bearing numerous clusters of small, yellow, fragrant flowers. *Fruit* a flat legume, 3–8 cm long.

Fig. 13.1b: *Acacia dealbata* Link: twig

Status and distribution: Introduced, native to South-West Australia and Tasmania. In *Patagonia,* only in the more temperate areas, e.g. El Bolsón.
Hardiness: –4° C
Uses: Wood for carpentry; good timber.

Acacia melanoxylon R. Br.

Syn.: *Racosperma melanoxylon* (R. Br.) C. Mart.; *Mimosa melanoxylon* (R. Br.) Poir.; *Acacia arcuata* Spreng
E: Autralian blackwood, blackwood, blackwood acacia
Sp: Aromo australiano, acacia australiana, acacia, acacia negra, acacia de madera negra, aromo negro, aromo salvaje
Fam. Mimosaceae

Fig. 13.2a,b: *A. melanoxylon*: **a:** shape [Castro]; **b:** flourishing tree [Valdivia]

Evergreen tree, up to 18 (45) m tall, with a straight, erect stem. *Bark* dark brown, deeply furrowed. Young *twigs* hirsute. *Adult leaves* reduced to flattened *phyllodia,* occasionally mixed with bi-pinnate, transitional leaves; *phyllodia,* 5–11 cm long and up to 2 cm across, dark green, dull, lanceolate to oblanceolate, slightly falcate, with 3–7 main longitudinal (prominent) veins. *Flowers* creamy white. *Fruit* a legume, 7–12 cm long, reddish-brown, compressed and twisted.

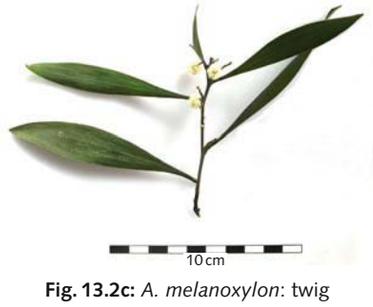


Fig. 13.2c: *A. melanoxylon*: twig

Status and distribution: Introduced; native to South-East Australia and Tasmania.
Hardiness: –4° C.
Uses: Planted for firewood and timber, and for ornamental reasons, above all in Chile.

Fig. 13.2d: *A. salicina*: twig

Remarks:

a. The heartwood contains the allergen acamelin, a quinone causing contact dermatitis and bronchial asthma.

b. It can become noxious, invading the understorey of pine and *Eucalyptus* plantations, and it can also replace grassland and shrubland, transforming these habitats. *A. melanoxylon* reproduces prolifically after fire and may facilitate the development of regrowth forests in certain areas. (See GISD).

c. A. salicina Lindl. (syn.: *Racosperma salicinum* (Lind.) Pedley; English: cooba, native willow, willow wattle, Broughton willow), a tree up to 6 m tall with pendulous branches, has phyllodia which show only a prominent midvein but otherwise resemble those of *A. melanoxylon*.

Acer L.

Fam. Aceraceae

The 4 species included in our manual have the following traits in common: *Deciduous* trees. *Leaves* opposite and decussate, with petioles several cm long. *Fruit* of 2 single-seeded winged halves, usually still attached when they shed, the halves separating later.

The genus *Acer* comprises over 100 species, most of them native to temperate regions of the Northern Hemisphere. In *Patagonia,* maples are mainly ornamental.

Uses:

a. Wood: Above all *A. pseudoplatanus* is highly appreciated for furniture, veneers, musical instruments, domestic and industrial uses.

b. In medicine: The leaves of *A. platanoides* contain the tannin pentagalloyl-ß-d-glucose which has an antiviral activity against human immunodeficiency virus. MM.

Remark: A. platanoides can become an invasive species (see GISD).

Acer pseudoplatanus L.

E: Sycamore maple, European sycamore, great maple

Sp: Arce blanco, falso plátano, arce sicomoro

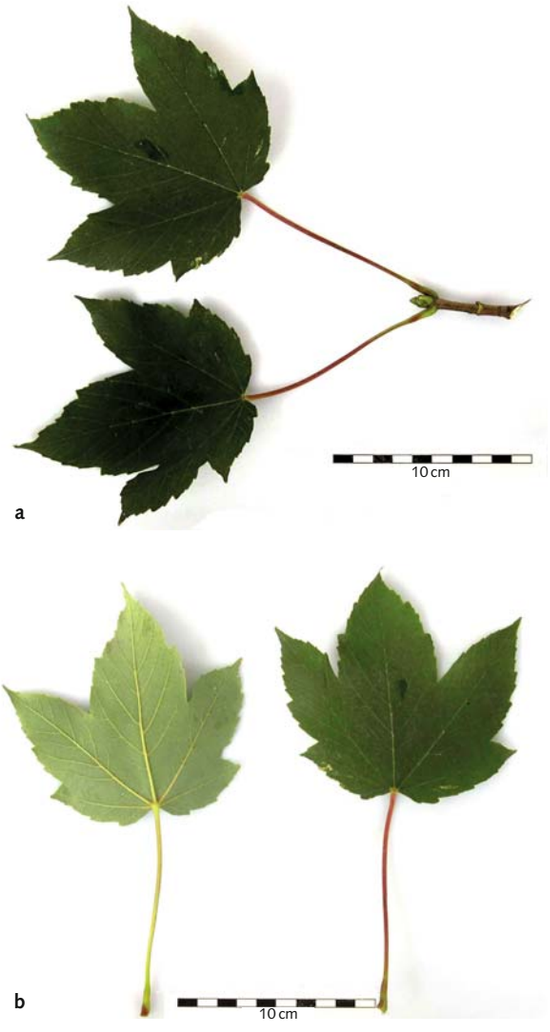


Fig. 13.3a–c: *Acer pseudoplatanus* L.: **a:** twig; **b:** leaf, underside and upper side; **c:** bark

Fig. 13.3d: *Acer pseudoplatanus* L.: inflorescence

Acer platanoides L.
E: Norway maple
Sp: Arce real, acirón

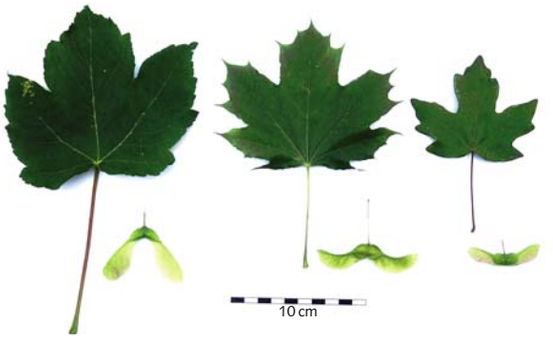


Fig. 13.3g: Comparison *A. pseudoplatanus, A. platanoides* L., *A. campestre* (from left to right): leaves and fruits

Acer campestre L.
E: Field maple, hedge maple, common maple
Sp: Arce menor, arce común, arce, acirón, moscón escarro

Fig. 13.3e: *A. campestre* L.: twig

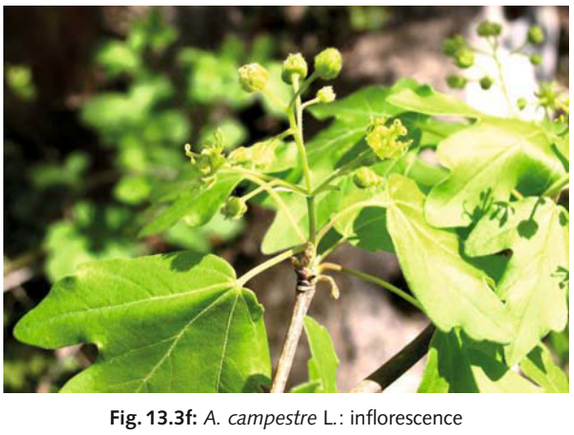


Fig. 13.3f: *A. campestre* L.: inflorescence

Acer negundo L. (= *Negundo aceroides* Moench)
E: Box elder, ash-leaved maple, Manitoba maple
Sp: Arce de hojas de fresno, arce negundo, negundo, erable

Fig. 13.3h: *A. negundo* L.: twig

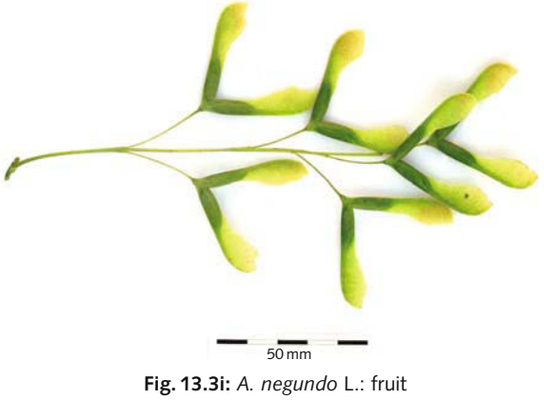


Fig. 13.3i: *A. negundo* L.: fruit

Characters	*A. pseudoplatanus*	*A. platanoides*	*A. campestre*	*A. negundo*
Height	up to 30 m	10–30 m	5–20 m	5–15 (20) m
Bark	grey, smooth, later scaling, revealing orange under-bark	greyish, striated	pale grey, fissured	greyish, smooth
Twigs	pale brown	from green to brown nodes	often developing corky ridges	green or glaucous, with prominent nodes
Leaves	palmatifid; 5 ovate lobes, irregularly toothed; *upper side* dark green, *underside* bluish; *petiole* reddish; *blade* 8–15 cm across	palmatifid; 5 acuminate lobes, with few large, long teeth; *both sides* shiny green; petiole reddish or greenish; *blade* 10–25 cm across	palmate-lobed; 5 obtuse lobes, slightly leathery; both sides green; *petiole* green or pink; *blade* 8–12 cm across	odd-pinnate, with 3–5 (7) tapering, irregularly toothed leaflets, the terminal one with 3 lobules; *upper side* shiny green, underside paler; *petiole* yellowish or pink; *leaves* 5–20 cm long
Inflorescence	hanging, paniculiform racemes	erect corymbs	erect corymbs	*dioecious* species; hanging racemes
Flowers	yellow-green ; Fl. 11–12	yellowish-green; Fl. 10	yellow-green; Fl. 11	greenish, without petals; Fl. 9–10
Fruits	in an angle of 60–90°, apex rounded; Fr. 2–5	in an angle of 45°, apex acute; Fr. 2–5	stretched, 180°: Fr. 2–4	in an angle of 60°, apex acute Fr. 3–5
Origin	Europe and south-western Asia	Europe and south-western Asia	Europe, Asia, northern Africa	North America
Hardiness	–32° C	–28° C	–28° C	–32° C

Aesculus hippocastanum L.
E: Common horse chestnut, horse chestnut, buckeye
Sp: Castaño de la India, castaño de las Indias de flores bancas, falso castaño, castaño de Indias
Fam. Hippocastanaceae
(†)

Fig. 13.4a: *Aesculus hippocastanum* L.: shape; **b:** bark

Deciduous tree, up to 30 m tall; *crown* broadly columnar. *Bark* red-brown or greyish, scaly. *Buds* very large, ovoid, shiny brown, resinous. *Leaves* opposite, palmatisect, with a petiole to 20 cm long; *leaflets* 5–7, obovate, 10–30 cm long, *base* cuneate, *apex* acuminate, *margin* irregularly serrate, *upper side* dark green, *underside* yellowish-green. *Flowers* in upright panicles, reaching 30 cm of length: mono-symmetric, white with yellowish or red blotches; *petals* 4–5, unequal; *stamens* 7. *Fruit* a rounded, thick-walled, green capsule, covered with blunt spines, opening through 3 valves. *Seeds* 2–3, chestnut-like, spherical, red-brown. Seeds can be poisonous.– Fl. 11–12. Fr. 3–4.

Fig. 13.4c: *Aesculus hippocastanum* L.: inflorescence

Fig. 13.4d: *Aesculus hippocastanum* L.: twig with leaves showing underside

Status and distribution: Introduced; native to Albania and northern Greece.

Habitat: Mountain woods, on fairly moist soils. In Patagonia, as elsewhere, a highly appreciated ornamental species.

Hardiness: –28° C.

Remarks: In southern and central Europe, *A. hippocastanum* is presently (2004) threatened by the horse-chestnut leaf miner *Cameraria ohridella* Deschka et Dimic. *C. ohridella* can have up to four generations a year, leaving the infested trees defoliated at the end of the season. In 2004, 2005, and 2007, there were no traces of it in Patagonia.

Fig. 13.4e: *Aesculus hippocastanum* L.: leaf (upper side)

Fig. 13.4f: *Aesculus hippocastanum* L.: leaf, perforated by *Cameraria ohridella* Deschka et Dimic

A favourite in gardens is *A. parviflora* Walter (Dwarf Horse Chestnut), a deciduous tree or shrub, up to 5 m tall, having non-resinous *buds*, palmatisect *leaves*, and white *flowers*, with long exerted *stamens* and red anthers, borne in upright panicles, 20–30 cm long; native to the south-eastern USA.

Hardiness: –16° C.

Uses:

a. Wood: For fencing, gates, packaging; also used in fibre-boards, etc.

b. In medicine: The bark of *A. hippocastanum* contains several coumarins (e.g. esculin); the leaves, the flavonol kaempferol, which shows anti-inflammatory, antibacterial and mutagenic activities, and triterpenoid saponins (aescin), having haemolytic activities, as well as anti-inflammatory, anti-exudative, venotonic, and cancerostatic activities. TEM.

Fig. 13.4g: *A. parviflora* Walter: shape

Aextoxicon punctatum Ruiz & Pav.

E: Olivillo

Sp: Tique, teque, olivillo, aceitunillo, palo muerto, tiique, roble de Ovalle

Fam. Aextoxicaceae

Fig. 13.5a,b: *Aextoxicon punctatum* Ruiz & Pav.: **a:** old forest [Curiñanco (Valdivia)]; **b:** shape with young foliage [Frutillar]

Fig. 13.5c: *Aextoxicon punctatum* Ruiz & Pav.: bark

Evergreen, dioecious tree, up to 20 m tall; *crown* rounded, compact. *Bark* light-grey, comparatively smooth. *Leaves* opposite or sub-opposite, simple, stalked, 4–9 cm long and 2–3 across; *blade* oblong-elliptic, leathery, *upper side* dark green, *underside* ash-grey and covered with small scales having red points; *margin* entire, somewhat sinuate. *Flowers* on axillary, hanging, short racemes: *male* flowers with 5 reddish *sepals,* 5 yellowish *petals,* and 5 *stamens* which alternate with 5 discoid glands; *female* flowers with a similar perianth, but the petals are smaller, sometimes absent; *gynoecium* with a unilocular ovary and a bifid style. *Fruit* an ovoid, hard, smooth, violet drupe, 1 cm long.– Fl. 5–6.

Status and distribution: Native; in Argentina: CHU, RN, only in the PN Lago Puelo; in Chile: from the Prov. of Limarí to the Prov. of Chiloé (Regions IV-X).

Habitat: The species prefers template, very moist conditions. It forms almost mono-specific forests in the Province of Valdivia (Chile). It associates e.g. with *Drimys winteri, Eucryphia cordifolia, Laurelia philippiana, Luma apiculata, Myrceugenia exsucca, Weinmannia trichosperma.*

Elevation: 0–1000 m.

Uses: Chestnut-coloured wood, used for the interior coating of buildings, floors, boxes, furniture, etc.

Fig. 13.5d: *Aextoxicon punctatum* Ruiz & Pav.: twig with unfolding leaves

Fig. 13.5e: *Aextoxicon punctatum* Ruiz & Pav.: leaves, underside and upper side

Fig. 13.6b: *Ailanthus altissima* (Mill.) Swingle: leaflets, underside and upper side

Ailanthus altissima (Mill.) Swingle
Syn.: *Ailanthus glandulosa* Desf., *Toxicodendron altissimum* Mill.
E: Tree of heaven, ailanthus
Sp: Árbol del cielo, ailanto, barniz del Japón
Fam. Simaroubaceae
†

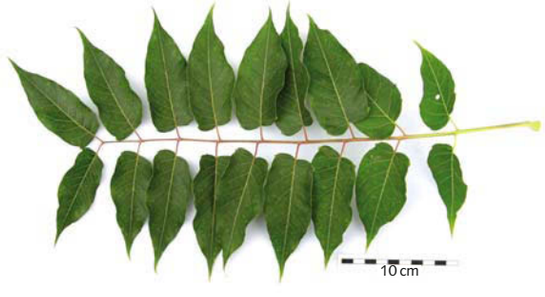


Fig. 13.6a: *Ailanthus altissima* (Mill.) Swingle: leaf

Deciduous dioecious or polygamous tree, up to 20 m tall, with a broadly conical *crown*. *Bark* reddish to grey, smooth, longitudinally fissured with age. *Young twigs* slightly pubescent. *Leaves* alternate, even-pinnate and odd-pinnate on the same plant, 45–60 cm long, with 13–25 opposite *leaflets*, 7–12 cm long, their *base* truncate and their *apex* tapering; the *margin* of the leaflets with 2–4 teeth near the base. *Flowers* 7–8 mm, in panicles of 10–20 cm length; *sepals* 3–5; *petals* 5; *stamens* 10 in male flowers, 2–3 in hermaphrodite flowers; *carpels* 5–6, ovary superior. *Fruit* a samara, 3–5 cm long, with the seed-part in the middle, reddish to grey when ripe.

Status and distribution: Introduced; native to northern China; naturalized in many regions. In Patagonia, at present mainly ornamental.
Hardiness: –24° C.
Uses:
a. Wood: For cabinet making, coverings, handles of tools, packaging, etc.
b. In medicine: The plant contains several nortriterpenoids, e.g. ailanthone, with an amoebicidal activity, chaparrinone, with an antileukaemic activity. TCM.
Remarks: Male flowers smell unpleasantly, their pollen is allergenic. The plant contains alkaloids that can cause nausea and paralysis of the respiratory apparatus. It is a very aggressive, invasive species; it regenerates from root suckers and can so form small woods issuing from one individual. (See GISD.)

Fig. 13.6c: *Ailanthus altissima* (Mill.) Swingle: part of the inflorescence

Fig. 13.6d: *Ailanthus altissima* (Mill.) Swingle: panicle with fruits

Fig. 13.6e: *Ailanthus altissima* (Mill.) Swingle: fruits

Albizia julibrissin Durazz.

E: Silk tree, Persian silk tree, pink siris, bastard tamarind, mimosa, nemu tree
Sp: Acacia de Constantinopla, árbol de la seda
Fam. Mimosaceae

Fig. 13.7a: *Albizia julibrissin* Durazz: shape [Trelew]

Fig. 13.7b: *Albizia julibrissin* Durazz: twig with flowers and fruits

Fig. 13.7c: *Albizia julibrissin* Durazz: leaves, underside and upper side

Deciduous small tree, 3–6 m tall, having a slim stem and an umbrella-like *crown*. *Bark* smooth, chestnut-brown. *Young twigs* glabrous, angled. *Leaves* alternate, bi-pinnate, stalked, with a hairy petiole – carrying a gland near its base – and a hairy rachis, 20–30 (–40) cm long, divided into 6–12 pairs of pinnae, each with 20–30 leaflets; the *leaflets* oblong to falcate, 0.7–1.5 cm long and 2–4 mm across, with a truncate base, a tapering apex and a ciliate margin. *Inflorescences* are terminal, spherical umbels, 2–5 cm across, carrying 20–25 small, conspicuous *flowers*. The individual *flowers* with a 5-toothed, up to 5 mm long *calyx*, a short funnel-like *corolla* of united petals, and numerous *stamens*, with up to 2.5 cm long *filaments*, usually pink-coloured in their upper part and white at their base. *Fruit* a membranous, oblong, tapering legume, 9–20 cm long., containing several seeds. *Seeds* egg-shaped, brown,up to 1 cm long. Fl. 1–3.

Status and distribution: Introduced; native to Asia, from Turkey to China and Korea. In Patagonia, an appreciated ornamental species in the more temperate areas.

Hardiness: –25 °C.

Remark: A. julibrissin is a potentially invasive species and has become a problem in Japan and the USA (see GISD).

Alnus Miller
Fam. Betulaceae

Fig. 13.8a: *Alnus glutinosa* (L.) Gaertn.: Shape [Riehen, Switzerland]

Deciduous, monoecious trees. *Leaves* alternate, simple, stalked; *stipules* early-falling. *Male flowers* in pendulous catkins, thereby 3 flowers in the axil of each bract: *perianth* with 4 lobules; *stamens* 4. *Female flowers* in ovoid erect, green catkins, thereby 2 in the axil of each bract: *perianth* absent; *ovary* bilocular; *styles* 2. *Fruiting catkins* cone-like, ovoid or ellipsoidal, 1–3 cm long, black or dark brown, woody, thick, long persistent. *Fruit* a two-winged nutlet.– Fl. 8–9. Fr. 1–3.

The genus *Alnus* comprises about 30 species, native to the temperate and warm-temperate regions of both hemispheres. In Patagonia, *A. glutinosa* is planted along water courses and on periodically flooded areas. This species, as well as *A. incana*, are appreciated as ornamental plants.

Uses:

a. Wood: A. glutinosa is highly estimated for furniture and decorative work, also used for construction, domestic and industrial tools, etc. A. incana's wood is mainly used as firewood.

b. In medicine: Bark and leaves of *Alnus* spp. contain tannins, stilbenes, triterpenes, being used e.g. against inflammations of mucous membranes. TEM.

Characters	*Alnus glutinosa*	*Alnus incana*
Leaf-blades	obovate to suborbicular, 4–10 cm long and 5–7 across; *apex* blunt or notched; *margin* bi-serrate; *upper side* shiny green, *underside* paler	ovate-elliptic, 5–10 cm long and 3.5–7 across; *apex* acute or acuminate; *margin* bi-serrate; *upper side* dark green, *underside* blue-white or greyish
Young twigs	sticky, usually glabrous	pubescent or tomentose
Female catkins	pedunculate	more or less sessile
Bark	dark brown, fissured	grey or yellowish, smooth
Habitat	beside water courses, on wet soils	on moist mountain slopes
Origin	northern Africa, western Asia, central Europe	Caucasus, Europe
Hardiness	–28° C	–36° C

Alnus glutinosa (L.) Gaertn.
Syn.: *Betula alnus* var. *glutinosa* L.
E: Common alder, black alder
Sp: Aliso, alno, umero, omero, aliso común

Fig. 13.8b: *Alnus glutinosa* (L.) Gaertn.: twig, with male and female catkins

Alnus incana (L.) Moench
Syn.: *Betula alnus* L. var. *incana* L.
E: Grey alder, speckled alder
Sp: Aliso gris

Fig. 13.8d: *Alnus incana* (L.) Moench: twig, with male and female catkins

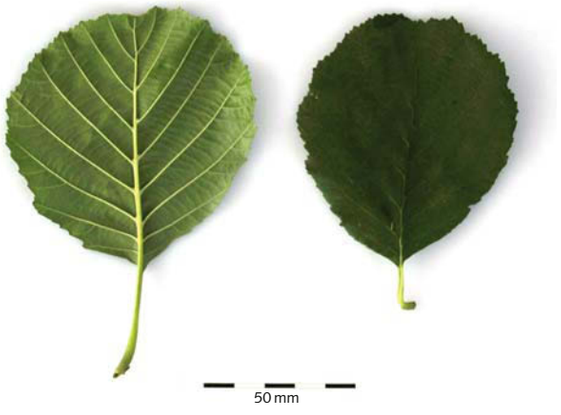


Fig. 13.8c: *Alnus glutinosa* (L.) Gaertn.: leaves, underside and upper side

Fig. 13.8e: *Alnus incana* (L.) Moench: leaves, underside and upper side

Amomyrtus luma (Mol.) Legrand & Kausel
Syn.: *Eugenia darwinii* Hook. f., *Myrtus luma* Molina, *Pseudocaryophyllus darwinii* (Hook. f.) Burret
E: ?
Sp: Luma, palo madroño, reloncaví, cauchao (frutos), caochao, cauchahue (en Chile), chauchau (the fruit in Mapuche)
Fam. Myrtaceae

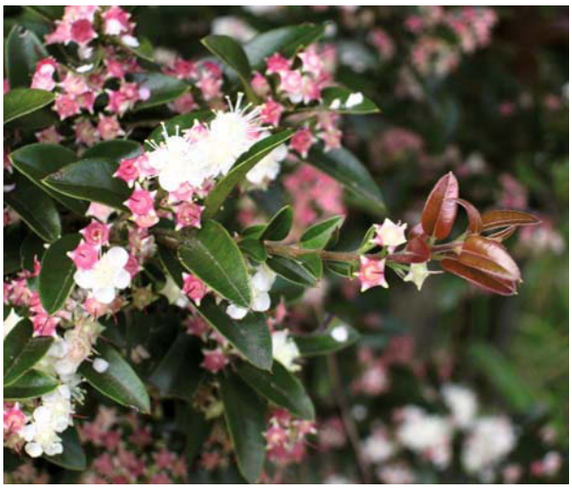


Fig. 13.9a: *Amomyrtus luma* (Mol.) Legrand & Kausel.: twig, with flowers and young leaves

Fig. 13.9b: *Amomyrtus luma* (Mol.) Legrand & Kausel.: twig, underside

Evergreen, richly branched tree, up to 20 m tall. *Bark* cinnamon to grey, smooth, with dark patches. *Twigs* hairy. *Leaves* opposite, simple, stalked, 2–5 cm long and 0.7–2 across, stalk hairy; *blade* ovate-oblong, leathery, pointed-glandular and very aromatic, the *upper side* darker than the *underside*; *apex* mucronate, base cuneate; *margin* entire; *midvein and margin* slightly pubescent. *New buds* reddish. *Flowers* on axillary racemes: white, aromatic, 5–6 mm in diameter; *calyx* of 5 very short lobules; *petals* 5; *stamens* numerous; *gynoecium* with an *inferior* bilocular, pluriovulate ovary. *Fruit* a violet-black berry; edible.– Fl. 10–1. Fr. 12–3.

Status and distribution: Native; in Argentina: CHU, NE, RN, SC, TF; in Chile: from the Prov. of Talca to the Prov. of Aisén (Regions VII-XI).

Habitat: On moist soils, especially on borders of rivers and lakes. It associates with *Drimys winteri, Embothrium coccineum, Podocarpus nubigenus, Saxegothaea conspicua.*

Elevation: 500–1500 m.

Uses: Hard, heavy wood, employed for farming tools, firewood, etc. Berries used to prepare sweets and a sort of wine, chicha. The extract is reported to have astringent and stimulating properties. Appreciated also as an ornamental species.

Remark: In Chile, between Valdivia and Chiloé, grows also *Amomyrtus meli* (Phil.) Legr. & Kausel; *bark* almost white, peeling off in stripes; *leaves* glabrous, with a lemonscent – traits distinguishing it from *A. luma*.

Fig. 13.9c: *A. melli* (Phil.) Legr. & Kausel.: bark, peeling off, without epiphytes

Aristotelia chilensis (Mol.) Stuntz
Syn.: *Aristotelia macqui* L'Herit., *Aristotelia glandulosa* R. et P., *Cornus chilensis* Molina
E: Macqui
Sp: Maqui, clon, macqui, maquei, queldrón, coclón, maki (fruit in Mapuche)
Fam. Elaeocarpaceae

Fig. 13.10a: *Aristotelia chilensis* (Mol.) Stuntz: twig

Evergreen, dioecious tree or shrub, up to 4 m tall. *Trunk* divided. *Bark* smooth, peeling off in straps. *Leaves* opposite-decussate, simple, 3–8 cm long and 1.5–3.5 across, with a reddish *petiole*, 1.5–2 cm long; *blade* ovate-lanceolate, shiny light-green, with prominent veins; *margin* serrate. *Flowers* on axillary corymbs of 2–4 units: pale-yellow, 5–6 mm in diameter, with 5 *sepals* and 5 *petals*; the *male* flowers with 10–15 stamens; *female* flowers with a trilocular ovary and a trifid style. *Fruit* a black, glossy berry; edible.– Fl. 10–11. Fr. 12–1.

Status and distribution: Native; in Argentina: CHU, NE, RN, above all in the PN Lanín, Nahuel Huapi, Los Alerces; in Chile: from the Prov. of Limarí to the Prov. of Aisén (Regions IV-XI).

Habitat: Preferably on moist soils, in gorges, on edges of forests; a pioneer after burnt or exploited soils, colonising and forming "macales".

Uses:

a. Wood: Soft, used in popular craftsmanship, also for poles, frames, etc.

b. In medicine: In popular medicine, the juice is employed against fever, as a sedative, and to treat wounds and tumours. The fruits are also used against diarrhoea. TSAM.

c. Other uses: The bark, for ropes. The fruit, for preparing jam and alcoholic beverages (tecu, chicha). The juice helps to dye wool vine-violet.

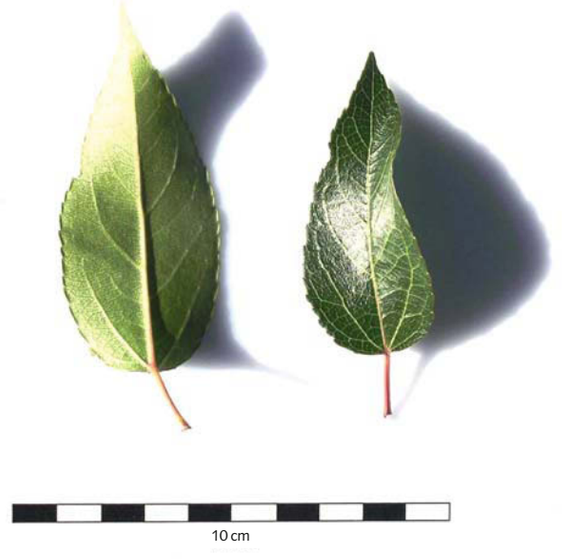


Fig. 13.10b: *Aristotelia chilensis* (Mol.) Stuntz: leaves, underside and upper side

Azara microphylla Hook. f.
Syn.: *Azara borealis* Phil.
E: Boxleaf azara
Sp: Chin-chin; chinchín; roblecillo
Fam. Flacourtiaceae

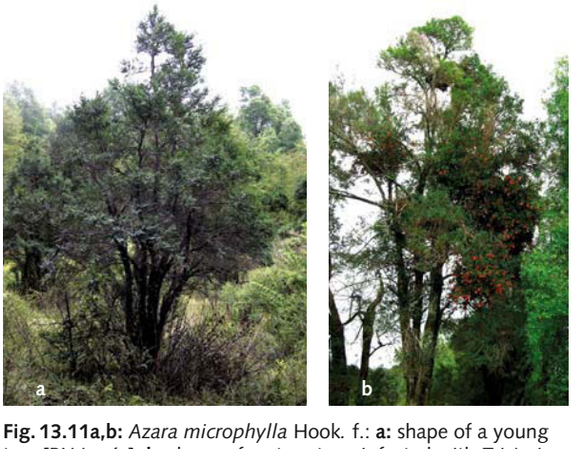


Fig. 13.11a,b: *Azara microphylla* Hook. f.: **a:** shape of a young tree [PN Lanín]; **b:** shape of mature tree, infected with *Tristerix corymbosus* (L.) Kuijt (see Fig. 13.94a) [PN Lanín]

Evergreen shrub or tree, up to 5 (8) m tall; *crown* spherical. *Young branches* pubescent. *Leaves* alternate, simple, 0.8–2 (2.5) cm long and 0.4–0.8 (1.7) across, shortly stalked, with a *leaf-like stipule*; *blade* obovate or elliptic, leathery, shiny; *apex* obtuse or emarginate; margin entire, occasionally slightly toothed. The *stipule*, which looks like a

Fig. 13.11c: *Azara microphylla* Hook. f.: bark

leaf blade of half-size, is orbicular, perennial. *Flowers* in axillary corymbs or solitary: *greenish*; *sepals* 4–5; *corolla* absent; *stamens* 5. *Fruit* a globose berry, *reddish* or *violet-black* when ripe.– Fl. 9–10.

Status and distribution: Native; in Argentina: CHU, NE, RN; in Chile: from the Prov. of Limarí to the north of Chiloé (Regions IV-X).

Habitat: Moist forests and bordering watercourses.

Elevation: 0–1000 m.

Remark: Quite common is *A. lanceolata* Hook f., a richly branched shrub, with lanceolate or elliptic *leaves*, 2.5–6 cm long and 0.5 across, with a serrate *margin*, and leafy, rounded *stipules*.

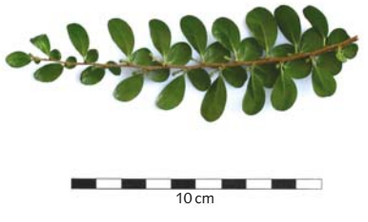


Fig. 13.11d: *Azara microphylla* Hook. f.: twig

Fig. 13.11e: *A. lanceolata* Hook. f.: twig

Betula L.

Fam. Betulaceae

Deciduous, monoecious trees or shrubs. *Leaves* alternate, simple, stalked, with a serrate margin; stipules caducous. *Male flowers* in axillary, pendulous catkins, *with* perianth; *female flowers* in green, erect or slightly drooping catkins, *without* perianth, ovary bilocular. *Fruit* a two-winged nutlet.– Fl. 10. Fr. 11–1.

About 40 species, native to the Northern Hemisphere. In Patagonia, several plantations of *B. pendula*. The 3 species we describe are appreciated as ornamental plants.

Uses:

a. Wood: B. pendula is used for cabinet making, turnery, veneers, and floors; also as firewood.

b. In medicine: In the leaves of *Betula* spp., rhododendrin, a phenolic with diuretic and diaphoretic activities. In the tar, guaiakol, a phenol with expectorant activity. Betulin, a triterpenoid found in the bark of *Betula* spp., has antitumour activity. TEM.

Betula pendula Roth.

Syn.: *Betula alba* sensu Coste, non L., *Betula verrucosa* Ehrh.

E: Silver birch, European birch

Sp: Abedul común, abedul plateado, abedul europeo, abedul, bedul, bieso, aliso blanco, chopa blanca

Fig. 13.12a: *Betula pendula Roth.*: shape [Esquel]

Fig. 13.12b: *Betula pendula Roth.*: twig

Betula pubescens Ehrh.
E: Hairy birch, white birch
Sp: Abedul, bedul, bieso, aliso blanco, chopa blanca

Betula papyrifera Marshall
E: Paper birch, canoe birch
Sp: Abedul del papel

Fig. 13.12c: *Betula pendula Roth.*: leaves, underside and upper side

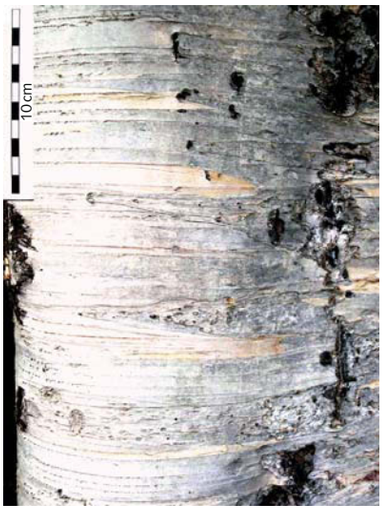


Fig. 13.12f: *B. papyrifera* Marshall: bark

Fig. 13.12d,e: *Betula pendula Roth.*: **d:** bark of a young tree; **e:** bark of an old tree

Fig. 13.12g: *B. papyrifera* Marshall: leaves

Characters	*Betula pendula*	*Betula pubescens*	*Betula papyrifera*
Bark	silvery-white; older trees rough and black toward the base of the trunk	silver-grey; often brownish toward the base of the trunk	white, with dark lenticels, peeling in thin layers; pale orange when freshly exposed
Branches	slender and pendulous	usually not pendulous	ascendent
Twigs	hairless. with whitish warts	hairy or with sticky brown warts	hairy
Leave-blades	ovate-triangular, long pointed, 2–7 cm	ovate or rhombic, short pointed, 2–7 cm	ovate, long pointed, 4–10 cm
Leave-margin	sharply bi-serrate, with prominent primary teeth	irregularly serrate, without prominent primary teeth	often irregularly serrate, with small teeth
Habitat	mainly on sandy or peaty soils	mainly on peaty soils of moorland and mountains	on mountains
Origin	Europe and northern Asia	Europe and northern Asia	North America
Hardiness	–40° C	–36° C	–36° C

Buddleja globosa Hope
Syn.: *Buddleja capitata* Jacq., *Buddleja connata* Ruiz & Pav., *Buddleja globifera* Duhamel
E: Orange ball
Sp: Matico, pañil, palquín, palqui, pallín, ballín, palguñi (in Mapuche)
Fam. Buddlejaceae

Fig. 13.13a: *Buddleja globosa* Hope: twig

Half-evergreen shrub or tree, quite erect, 2.5–3 m tall. *Leaves* opposite, simple, 6–20 cm long, sessile or shortly stalked; *blade* elliptic-lanceolate or lanceolate, *apex* tapering; *upper side* wrinkled, green, *underside* yellowish tomentose; *margin* entire or finely crenate. *Inflorescences* dense, spherical, capitula of 1–2 cm in diameter, on long axillary or terminal peduncles. *Flowers* small, yellow or orange; *calyx* 4-parted; *corolla* tubular, 4-lobed; *stamens* 4; *ovary* bilocular, each locule pluriovulate. *Fruit* a capsule.– Fl. 10–11.

Status and distribution: Native; in Andean zones of Perú, Chile, and Argentina.

Habitat: Alongside roads, in scrubland, on hills, and in gorges.

Uses: A species of great ornamental value.– Leaves used to dye tissue coffee.

Uses in medicine: The leaves contain verbascoside, a phenylpropanoid with hypertensive, anti-inflammatory and antihepatotoxic properties. In traditional medicine, leaves and flowers are widely used to treat disorders of the intestine, to heal wounds, and against acne. TSAM.

Fig. 13.13b: *Buddleja globosa* Hope: leaves, underside and upper side

Fig. 13.13c: *Buddleja globosa* Hope: inflorescence

Remarks: A favourite in gardening is *B. davidii* Franch, an Asiatic species. Its *leaves* are ovate-lanceolate or oblong-lanceolate, tapering, white-tomentose on the *underside*; the violet or purple, scented flowers are borne on long and dense, conical panicles. *B. davidii* tends to naturalize rapidly.– Fl. 11–3.

Fig. 13.13d: *B. davidii* Franch: inflorescence

Fig. 13.13e: *B. davidii* Franch: leaves, underside and upper side

Caldcluvia paniculata (Cav.) D. Don

Syn.: *Weinmannia paniculata* Cav.
E: Brown alder
Sp: Tiaca, triaca, quiaca, triacatriaca, triala
Fam. Cunoniaceae

Fig. 13.14a: *Caldcluvia paniculata* (Cav.) D. Don: twig

Evergreen tree or shrub, up to 20 m tall. *Branches* extended, ascendant, the young parts pubescent. *Leaves* opposite, simple, 5–12 cm long and 2–4 across, with a petiole 0–8–1.5 cm long, and with 2 *stipules* that are persistent, asymmetric, and toothed; *blade* elliptic or oblong-lanceolate, leathery, the *upper side* dark green, the *underside* light green; *margin* serrate. *Flowers* on axillary corymbs: small, white or creamy-white. *Fruit* a bilocular, bifid, hairy capsule, 7–8 mm long.– Fl. 1–2. Fr. 3–4.

Status and distribution: Native; in Argentina: CHU, NE, RN, in the PN Lanín and Nahuel Huapi; in Chile: from the Prov. of Concepción to the Prov. of Aisén (Regions VIII-XI).

Habitat: It grows on very moist soils, in gorges, near rivers and lakes. It associates with *Drimys winteri, Eucryphia cordifolia, Gevuina avellana, Lomatia ferruginea, Luma apiculata, Nothofagus dombeyi*, among other species.

Uses: Wood soft, without important applications. Appreciated as an ornamental species.

Fig. 13.14b: *Caldcluvia paniculata* (Cav.) D. Don: leaves, underside and upper side

Fig. 13.15b: *Camellia japonica* L.: flower of a cultivated variety

Camellia japonica L.

Syn.: *Thea japonica* (L.) Noiss
E: Camelia
Sp: Camelia, camelio, camelio común
Fam. Theaceae

Fig. 13.15a: *Camellia japonica* L.: twig

Evergreen tree or shrub, up to 15 m tall; richly branched. *Leaves* alternate, simple, leathery, shortly stalked; *blade* broadly elliptic, thick, glabrous, 7.5–12 cm long and 3–7 cm across, shortly tapering, with 6–8 lateral veins, clearly visible but not prominent; *upper side* dark green, glossy, *underside* paler; *margin* serrate. *Flowers* sub terminal, solitary, sessile, conspicuous, 7–15 cm in diameter, white, red, striped, etc.; *sepals* 5; *petals* 5–6 in wild specimens, usually more in cultivated plants; *stamens* numerous, united in the lower half; *ovary* superior, generally trilocular, glabrous. *Fruit* a capsule, 4–5 cm in diameter, with 1–2 (8) seeds per locule. *Seeds* dark brown, up to 2.5 cm long. Fl. 7–8.

Status and distribution: Introduced; native to Japan and Korea. In Patagonia, an ornamental species, grown in gardens of Western Patagonia, above all in the coastal areas of Puerto Montt.

Remark: Camellia sp. is a calcifuge genus, adapted to acidic soils.

Castanea sativa Miller

E: Sweet chestnut, Spanish chestnut
Sp: Castaño, castaño común
Fam. Fagaceae

Fig. 13.16a: *Castanea sativa* Miller: branch

Deciduous, monoecious trees, up to 30 m tall; *crown* broad, rounded. Bark grey-brown, smooth, becoming spirally fissured and ridged with age. *Leaves* alternate, simple, 10–25 cm long, petiole up to 3 cm long; *blade* oblong-lanceolate, with a long-pointed tip, *upper side* glossy dark green and smooth, *underside* paler; *margin* grossly serrate, with acute teeth. *Flowers* on axillary, erect, up to 25 cm long catkins: creamy yellow, scented, insect-pollinated; *male* flowers on the upper, *female* on the lower part of the same catkin, or on separate, nearly terminal catkins. *Fruit* 1–3 red-brown, edible nuts, first enclosed by a green cupule, covered with long, branched, scarcely pubescent spines.– Fl. 12–1. Fr. 3–4.

Status and distribution: Introduced; native to certain regions of the Balkan and, perhaps, to southern Europe, naturalized elsewhere.

Habitat: In woods on well-drained soils, often on mountain slopes; usually calcifuge.

Elevation: 0–1800 m. In Patagonia, ornamental.

Hardiness: –20° C.

Fig. 13.16b: *Castanea sativa* Miller: inflorescence

Uses:

a. Wood: For furniture, veneers, farming tools, construction; also as firewood.

b. Other uses: Widely cultivated for its nuts which contain up to 70% starch, 2–4% protein, and 2–5% fat.

c. In medicine: The leaves contain vitamin K1, used to treat hypothrombinaemias; in popular medicine, the leaves are used as astringents. TEM.

Fig. 13.16c: *Castanea sativa* Miller: cupules of fruits, enclosing the nuts

Fig. 13.16d: *Castanea sativa* Miller: bark

Casuarina equisetifolia J.R. et G. Forster

Syn.: *Casuarina litorea* L; *Casuarina equisetifolia* L.

E: Casuarina, ironwood, coast she-oak, horsetail, Australian pine, whistling pine beefwood

Sp: Pino marítimo, Casuarina

Fam. Casuarinaceae

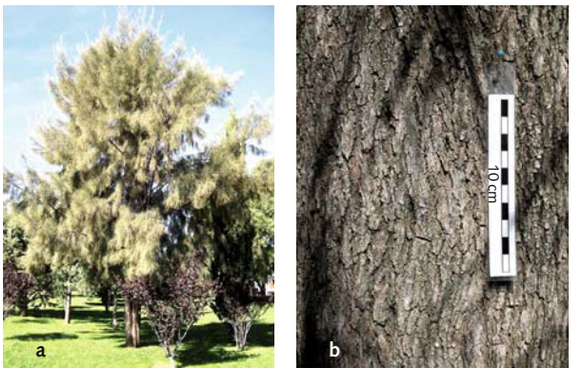


Fig. 13.17a,b: *Casuarina equisetifolia* J.R. et G. Forster: **a:** shape [Trelew]; **b:** bark

Partly evergreen, dioecious or monoecious tree, up to 30 m tall, having a pine–like appearance, which is increased by its drooping green branchlets and cone-like fruits. *Trunk* irregular, profusely branched. *Bark* smooth and light in younger specimens, turning thick and fibrous with age, flaking in stripes. *Branches* of two kinds: (i) persistent, forming the permanent plant structure, and (ii) deciduous, slender *twigs* which carry whorls of 6–7 scale-like, triangular leaves, united at base, on each node, thus conferring to the twig the appearance of an *Equisetum* (Horsetail). *Male flowers* in terminal or lateral 0.7–4 cm long spikes, each flower consisting of one stamen with 2 bracteoles. *Female flowers* in terminal compact, small, rounded inflorescences (capitula, heads); flowers without perianth. *Fruit* a samara, 6–8 mm long. *Seeds* winged.

Status and distribution: Introduced; native to the Southeast of Asia, Malaysia and northern Australia. In Patagonia, ornamental in warmer regions.

Hardiness: –4°C.

Remarks: C. equisetifolia is resistant to salt-laden winds; due to this, it is widely used to stabilise coastal sand dunes in warmer regions. Furthermore, it supports an actinorhiza symbiont in the root nodules and is thus nitrogen fixing. It can therefore grow on soils poor in nitrogen if adequate soil moisture is available. The species is also planted as windbreak to protect crops. *C. equisetifolia* can become a very nasty invasive species which displaces native dune and beach vegetation (e.g. in Florida, USA). (See GISD.)

Uses of wood: Due to being resistant to decomposition in soil or saltwater, it is used for making piles, poles, and fences. It provides good charcoal.

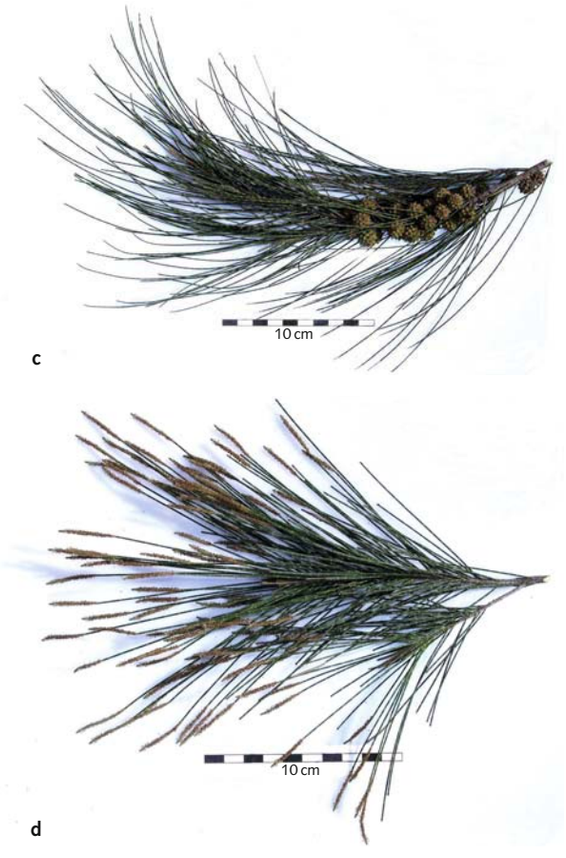


Fig. 13.17c,d: *Casuarina equisetifolia* J.R. et G. Forster: **c:** female twig; **d:** male twig

Catalpa bignonioides Walter

Syn.: *Catalpa catalpa* (L.) Karst., *Catalpa syringifolia* Sims
E: Indian bean tree, catalpa
Sp: Catalpa común, catalpa, catalpa de la Carolina
Fam. Bignoniaceae
(†)

Deciduous tree, up to 15 m tall; *crown* broad, profusely branched, rounded. *Bark* grey-brown, scaly. *Leaves* opposite, simple, petiole 8–16 cm; *blade* ovate, 10–20 cm long and 10–12 across, *base* cordate or truncate, *apex* abruptly acuminate, *margin* entire or with 2 small lobes, *upper side* light green and nearly hairless, *underside* hairy on the veins. *Flowers* in ample, terminal panicles: mono-symmetric, white, with yellow or purplish spots; *calyx* two-lipped; *corolla* two-lipped, 5-lobed, 3–5 cm long; *stamens* 2, staminodia 3; *ovary* bilocular, pluriovulate; style 1, stigma two-lobed. *Fruit* a cylindrical capsule, 25–35 cm long, long-persistent.– Fl. 12–1. Fr. 3–6.

Status and distribution: Introduced; native to the south-eastern USA.

Fig. 13.18a: *Catalpa bignonioides* Walter: shape [El Bolsón]

Habitat: Stream banks and low woods. In Patagonia, ornamental.

Hardiness: –28° C.

Remarks: The entire plant is slightly poisonous. Very similar to *C. bignonioides* is *C. speciosa* (Warder ex Barney) Engelmann (*Catalpa cordifolia* St.-Hil.), having a gradually tapering point and flowers with a wider opening.

Uses:

a. Wood: Manifold uses, for cabinet making, construction, etc.; also as firewood.

b. In medicine: The species of *Catalpa* mentioned contain catalpol – an iridoid with diuretic and laxative properties –, and tannins. Bark and fruits are used as analgesics and sedatives. TNAM.

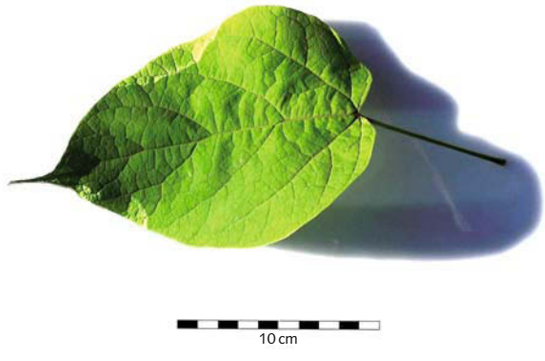


Fig. 13.18b: *Catalpa bignonioides* Walter: leaf

Fig. 13.18c: *Catalpa bignonioides* Walter: leaf and fruit

Fig. 13.18d: *Catalpa bignonioides* Walter: inflorescence

Fig. 13.18e: *Catalpa bignonioides* Walter: bark

Cercis siliquastrum L.

E: Judas tree

Sp: Árbol de Judas, ciclamor, árbol del amor, árbol de Judea

Fam. Fabaceae (Caesalpiniaceae)

Fig. 13.19a: *Cercis siliquastrum* L.: branch with inflorescence

Deciduous tree or shrub, up to 10 m tall, *stem* somewhat tortuous, *crown* open, spreading. *Bark* dark grey, cracking into small plates. *Twigs* red-brown. *Leaves* alternate, simple, petiole 1.5–4 cm; *blade* rounded or kidney-like, 4–12 cm long and 5–11 across, palmate-veined, purplish-green on both sides; *base* cordate, *apex* obtuse. *Flowers* precocious, in clusters along the 2–3-year-old branches, even emerging from the stem, appearing on the defoliated tree: pea-like, pink; *calyx* bell-shaped, with 5 sepals; the standard of the *corolla* smaller than the wings and the keel, partly covered by the wings; *stamens* 10; *carpel* 1. Fruit a flat legume, 6–10 cm long.– Fl. 9–11. Fr. 2–8.

Status and distribution: Introduced; native to the eastern Mediterranean region. In Patagonia, ornamental.

Hardiness: –16° C.

Fig. 13.19b: *Cercis siliquastrum* L.: flowers

Fig. 13.19c: *Cercis siliquastrum* L.: twig with fruits

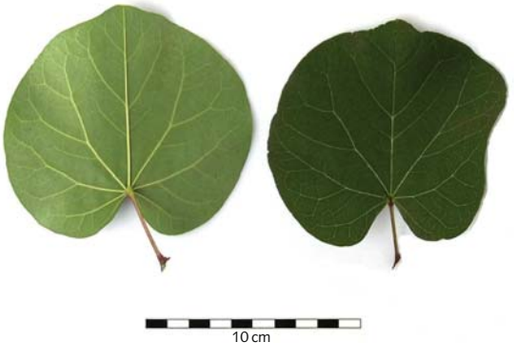


Fig. 13.19d: *Cercis siliquastrum* L.: leaves, underside and upper side

Colletia hystrix Clos

Syn.: *Colletia aciculata* Miers, *Colletia armata* Miers, *Colletta brevispina* Phil., *Colletta ferox* Gillies & Hook. var. *puberula* Speg
E: ?
Sp: Cunco
Fam. Rhamnaceae

Fig. 13.20a: *Colletia hystrix* Clos: shape [Esquel]

Shrub, occasionally a tree, up to 3 (5) m tall, profusely branched and very thorny. *Branches* virtually defoliated, ending in thorns, dark green; second order twigs opposite, also ending in thorns, the same applying to third order twigs. *Leaves*, when present, opposite, elliptic-oblong to elliptic-lanceolate, 5–12 mm long. *Flowers* in axillary fascicles: *pale pink or white*, to 5 mm in diameter, stalked; *calyx* tubular, with 5 teeth pointing outwards; *corolla* absent; *stamens* 5; *gynoecium* composed of 3 united carpels, with one style and 3 stigmas. Fruit a trilocular capsule.

Status and distribution: Native; in Argentina: CHU, NE, RN, SC; in Chile: from Santiago to the mountain chain of Chillán.

Habitat: It grows on sunny slopes, in areas of transition, but also as undergrowth in communities of *Nothofagus dombeyi*, *Fitzroya cupressoides*, and other species.

Elevation: 0–2000 m.

Fig. 13.20b: *Colletia hystrix* Clos: branch with flowers

Crataegus L.

Fam. Rosaceae

Deciduous, rarely half-evergreen shrubs or small trees, up to 10 m tall, richly branched. *Bark* rough. *Branches* with axillary thorns, sometimes missing in *C. laciniata*. Leaves alternate, simple, stipulate, stalked; *blade (margin)* lobed, pinnately lobed or toothed. *Flowers* in corymbs: white, pink, or reddish, with a bell-like *receptacle*, scented; *calyx* of 5 sepals inserted on the rim of the receptacle; *petals* 5; *stamens* about 20; *carpels* 1–5, free, *ovary* inferior, with 1 fertile ovule. Fruit 1–5 nuts, enclosed in a red to orange, cup-like receptacle, apple-type and berry-like, 1 cm across, having the remains of the sepals on its top end.– Fl. 11–12. Fr. 2–4.

Non-flowering shoots usually have larger and more deeply cut leaves, and also larger thorns than flowering shoots.

A genus of about 50 species, native to the Northern Hemisphere. In Patagonia, mainly 4 species and several cultivars of *C. laevigata* and *C. monogyna* are planted in

Characters	*C. laciniata*	*C. laevigata*	*C. monogyna*	*C. X Lavallei*
Leaves:				
shape	5–9 deeply incised, narrow, toothed lobes	3–5 superficially incised, rounded lobes, slightly leathery	3–7 deeply incised, acute lobes, untoothed or only toothed toward the apex	elliptic, acuminate, grossly toothed, leathery, thick
upper side	dark green, pubescent	glossy dark green, glabrous	deep green, glabrous	shiny dark green
underside	greyish, pubescent	matt, glabrous	pale, pubescent in vein-angles	tomentose
main veins	curving downwards	straight or curving upwards	curving downwards	curving upwards
size	3–5 cm x 2.5–4 cm	1.5–5 cm long	1.5–3.5 cm long	5–10 cm long and 2.5–4 cm across
Flowers:				
per corymb	12 or more	5–10 (12)	10–20	less than 10
length of petals	6–8 mm	5–8 mm	4–6 mm	6–8 mm
number of styles	3–5	2 (occasionally 3)	1	
Origin	south-eastern Europe, Sicily, northern Africa	Europe, western Asia, northern Africa	Europe, northern Africa, Asia	hybrid between *C. mexicana* and, maybe, *C. crus-galli*
Hardiness	–20° C	–24° C	–24° C	–28° C

gardens, pavements (sidewalks), and urban green-spaces. In certain regions, *C. monogyna* is also naturalized, e.g. in the PN Lanín.

Uses in medicine: The bark of *C. monogyna* contains a benzofuran with antifungal properties. The leaves and flowers of *Crataegus* spp. contain procyanidins and flavonoids and have cardiotonic properties. TEM, TCM, MM.

Crataegus laciniata Ucria
Syn.: *Crataegus orientalis* Pallas ex Bieb
E: Oriental thorn
Sp: Majo

Fig. 13.21a: *C. laciniata* Ucria: twig

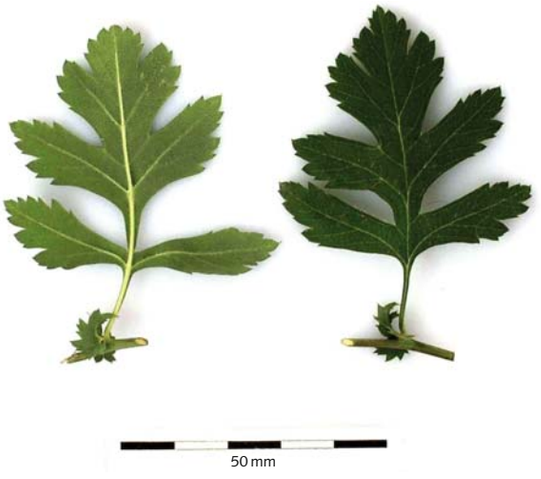


Fig. 13.21b: *C. laciniata* Ucria: leaves, underside and upper side

Fig. 13.21c: *C. laciniata* Ucria: bark

Crataegus laevigata (Poiret) DC.
Syn.: *Crataegus oxyacantha* L., *Crataegus oxyacanthoides* Thuill.
E: Midland hawthorn, may hawthorn
Sp: Espino blanco, espino navarro, oxiacanto

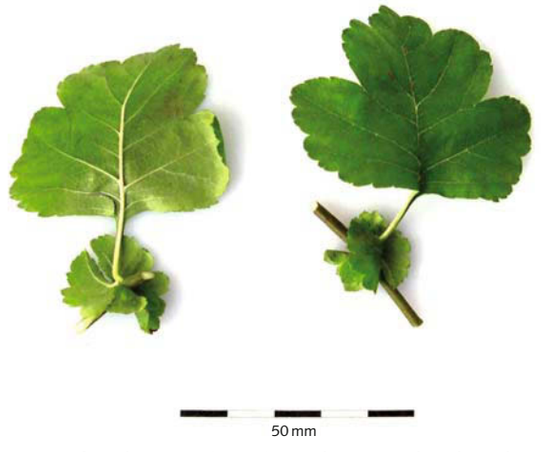


Fig. 13.21d: *C. laevigat*a (Poiret) DC.: leaves, underside and upper side

Crataegus monogyna Jacquin
Syn.: *Crataegus oxyacantha* L., nom. ambig.
E: Common hawthorn
Sp: Majuelo, espino albar, espino majuelo

Fig. 13.21e: *C. monogyna* Jacquin: shape [PN Lanín]

Fig. 13.21f: *C. monogyna* Jacquin: twig

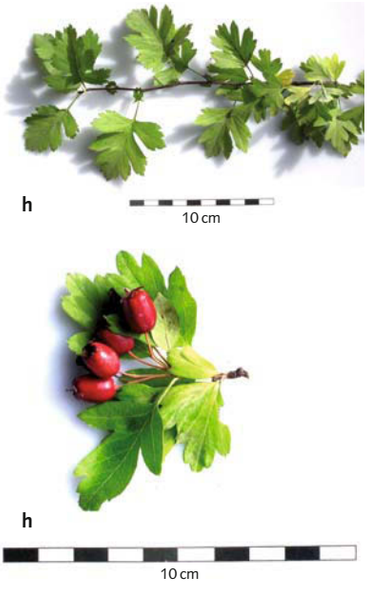


Fig. 13.21g,h: *C. monogyna* Jacquin:
g: leaves, underside and upper side;
h: twig with fruits

Crataegus x **Lavallei** Herincq ex Lavallée
Syn.: *Crataegus carrierei* Vauvel
E: Hybrid cockspur thorn
Sp: Majuelo de Lavalle

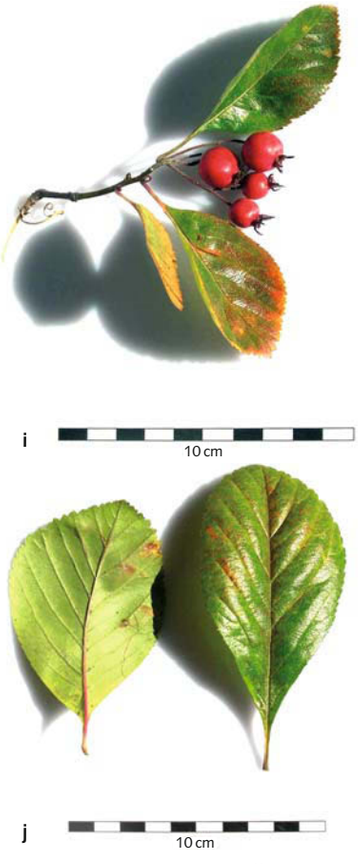


Fig. 13.21i,j: *Crataegus* x *Lavallei* Herincq ex Lavallée: **i:** twig with fruits; **j:** leaves, underside and upper side

Cryptocarya alba (Mol.) Looser
Syn.: *Peumus alba* Mol., *Peumus rubra* Mol., *Peumus mammosa* Mol., *Laurus peumo* Domb. ex Lamb
E: ?
Sp: Peumo
Fam. Lauraceae

Fig. 13.22a: *Cryptocarya alba* (Mol.) Looser: branch

Evergreen tree, up to 15 (20) m tall; *crown* rounded, densely foliated. *Bark* dark-grey, thin, smooth, slightly fissured. *Branches* ascendant. *Leaves* opposite, sub-opposite or alternate, simple, 3–8 cm long and 1.5–4.5 across, shortly stalked, glabrous; *blade* ovate-elliptic or oblong, leathery, aromatic, the *upper side* green, the *underside* blu-

Fig. 13.22b: *Cryptocarya alba* (Mol.) Looser: leaves

ish-green; apex obtuse or emarginate; *margin* entire, undulate. *Flowers* in axillary panicles, 2–6 cm long, with the units massed together: briefly tubular, greenish-yellow, 3–5 mm long; *tepals* 6, united at the basis, unequal, hairy within; *stamens* in three whorls; those of the inner vertical, staminodial; *gynoecium* with an *inferior* ovary, one style, and a triangular stigma. *Fruit* an ovate drupe, 1.5 cm long, red or pink; edible.– Fl. 8–12. Fr. 1–4.

Status and distribution: Native; in Argentina: only in the region of Lago Puelo; in Chile: from the south of the Prov. of Limarí to the Prov. of Cautín (Regions IV–IX).

Habitat: It grows in gorges and moist, shaded valleys. It associates e.g. with *Nothofagus obliqua, Persea lingue, Peumus boldus*.

Elevation: up to 1500 m.

Uses: Hard, grained wood, water-resistant, used e.g. for heels of shoes, in popular craftsmanship, and as firewood. The bark is rich in tannin and is used for tanning leather, and to dye it orange.

Cydonia oblonga Miller

Syn.: *Cydonia maliformis* Miller; *Cydonia vulgaris* Delarbre; *Cydonia vulgaris* Pers.
E: Quince
Sp: Membrillero, membrillo
Fam. Rosaceae

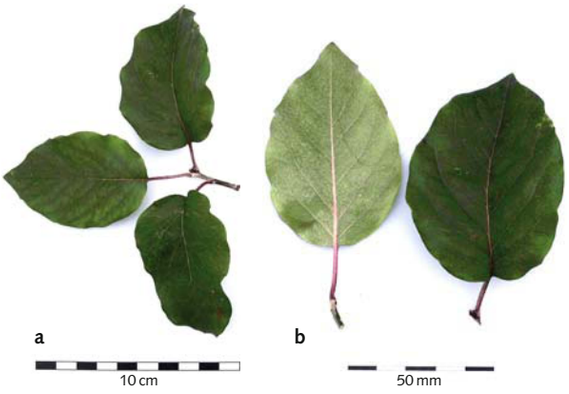


Fig. 13.23a,b: *Cydonia oblonga* Miller: **a:** twig; **b:** leaves

Deciduous tree or shrub, up to 7 m tall, with a richly branched *crown*. *Stem* often deeply fissured, appearing as if consisting of a bundle of branches. *Bark* purple-brown, flaking. Leaves alternate, simple, shortly stalked, 6–10 cm long and 4.5–6 cm across, broadly elliptic or ovate or rounded; *upper side* dark green, *underside* greyish white, cowered with small soft hairs, especially when young; *margin* entire, somewhat wavy. *Flowers* solitary, white or pale-pink, about 5 cm across, with 20 stamens. *Fruit* apple- or pear-shaped, greenish-yellow, downy, above all before maturity.

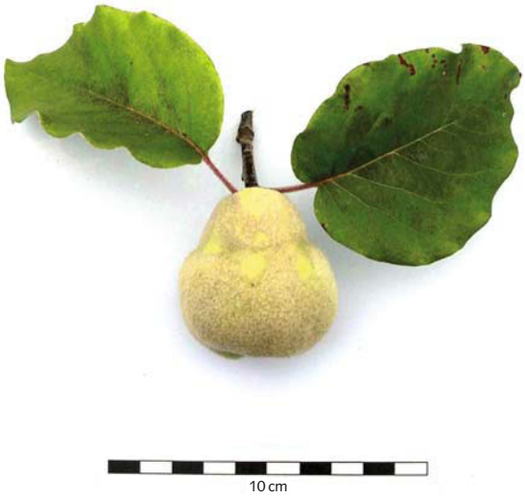


Fig. 13.23c: *Cydonia oblonga* Miller: twig with fruit

Fig. 13.23d: *Cydonia oblonga* Miller: bark

Hardiness: –20° C.

Status and distribution: Introduced; native to central and south-west Asia; adventitious in northern Africa and in many European countries; widely cultivated in varios regions of Argentina and Chile. In Patagonia, in gardens in the more temperate areas (e.g. Los Antiguos).

Uses:

a. Fruit: Very astringent when raw; when cooked, used for quince jelly.

b. Seeds: Mucilaginous, employed for producing bandoline, a gummy cream for fixing the hair. They are also used against diarrhoea, bronchitis,and skin disorders. TEM.

c. Wood: Appreciated for cabinet making and turnery.

Cytisus scoparius (L.) Link

Syn.: *Sarothamnus scoparius* (L.) Koch, *Spartium scoparium* L.

E: Broom, Scotch broom

Sp: Retama negra, hiniesta, escoba

Fam. Fabaceae

†

Shrub, up to 2.5 m tall, profusely branched. *Twigs* flexible, angled, ridged, dark-green. *Lower leaves* trifoliate, stalked, which fall easily off,leaving the shoot naked; *leaflets* obovate to oblanceolate, 8–15 mm long, sparingly appressed-pubescent; *upper leaves* simple, sessile: *Flowers* solitary or in axillary racemes: *yellow*, butterfly (pea-)-like, 1.6–2.5 cm long. *Fruit* a flat legume, 2.5–4 cm long.– Fl. 11–3. Fr. 1–4.

Status and distribution: Introduced, naturalized; in Argentina: BA, CHU, NE, RN, SC, TF; in Chile: in the southern regions. Origin: Western Europe.

Habitat: On degraded soils, bordering roads, on slopes, on moist soils; it is scarce on limy soils.

Uses: A very ornamental species. It was used for brooms.

Remark: The whole plant is poisonous.

Uses in medicine: The plant produces several alkaloids. e-g- sparteine (lupinidin), used in cardio-therapy, and lupanine, which is anti-arrhythmic and hypotensive. It also contains dopamine - a sympathomimetic. TEM, MM.

Fig. 13.24a: *Cytisus scoparius* (L.) Link: shape [Cucao, Chiloé]

Fig. 13.24b,c: *Cytisus scoparius* (L.) Link: **b:** twig with trifoliate and simple leaves; **c:** flowers and immature fruits

Dasyphyllum diacanthoides (Less.) Cabrera
Syn.: *Chuquiraga leucoxylon* Poepp. ex Less., *Flotovia diacanthoides* Less., *Piptocarpha diacanthoides* Hook. & Arn.
E: ?
Sp: Palo santo, tayu, trevo, palo blanco, tagú, tallú
Fam. Asteraceae

Fig. 13.25a: *Dasyphyllum diacanthoides* (Less.) Cabrera: shape [Puerto Blest]

Fig. 13.25c: *Dasyphyllum diacanthoides* (Less.) Cabrera: leaves

Evergreen tree, up to 20 m tall; *crown* narrow, dense. *Trunk* upright. *Bark* dark-grey, thin, and soft, with deep longitudinal fissures. *Young twigs* with twinned, straight spines, 1–2.5 cm long. *Leaves* alternate, simple, shortly stalked, 2–6 cm long and 1–3 across, with spiny, persistent *stipules*; *blade* elliptic or ovate, leathery, *upper side* dark-green, *underside* light-green; *apex* mucronate; margin entire. *Flowers white*, borne in capitula at the end of short shoots. *Fruit* an achene, with a white pappus.– Fl. 12–1.
Status and distribution: Native; in Argentina: CHU, NE, RN; in Chile: from the Prov. of Curico to the Prov. of Chiloé (Regions VII-X).
Habitat: Mainly in moist forests, but also in semi-arid areas; it grows together with *Drimys winteri, Laureliopsis philippiana, Lomatia hirsuta, Nothofagus dombeyi,* and other species.
Elevation: 500–1500 m.
Uses: Recommendable as an ornamental species.

Desfontainia spinosa Ruiz et Pav.
Syn.: *Desfontainia chilensis* Gay
E: ?
Sp: Taique, chapico (in Mapuche), trau-trau, michai blanco
Fam. Desfontainiaceae

Fig. 13.25b: *Dasyphyllum diacanthoides* (Less.) Cabrera: twig

Fig. 13.26a: *Desfontainia spinosa* Ruiz et Pav: branch

Fig. 13.26b: *Desfontainia spinosa* Ruiz et Pav: flower

Evergreen shrub, up to 2.5 m tall, richly branched. *Leaves* opposite, stalked, 4–6 cm long; *blade* ovate to elliptic, leathery, dark-green, shiny; *margin* bearing long, spiny teeth; apex acuminate-spiny. *Flowers* tubular, axillary, solitary, stalked; *calyx* of 5 persistent sepals; *corolla* tubular, red, but yellow at the tips of the 5 lobes; gynoecium with a superior, pluriovulate ovary. *Fruit* a globose berry.– Fl. 1–3. Fr. 1–4.

Status and distribution: Native; in Argentina: NE, RN, SC, TF, especially in the PN Lanín and Nahuel Huapi; in Chile: from the Región del Maule to Magallanes (Regions VII–XII).

Habitat: Together with other species of shrubs in the undergrowth of forests of *Nothofagus dombeyi, Fitzroya cupressoides,* etc. A species of great ornamental value.

Uses:

a. Leaves: The leaves are used to dye yellow.

b. In medicine: The plant contains several cucurbitacins which show cytotoxic and antileukaemic activities. In popular medicine, the infusion of the leaves is used as a sedative. TSAM.

Fig. 13.26c: *Desfontainia spinosa* Ruiz et Pav: twig with opposite leaves

Diostea juncea (Gillies ex Hook.) Miers.
Syn.: *Verbena juncea* Gillies ex Hook
E: ?
Sp: Retama, retamo
Fam. Verbenaceae

Fig. 13.27a: *Diostea juncea* (Gillies ex Hook.) Miers: shape as shrub [Cholila]

Shrub or small tree, up to 5 (7) m tall; *branches* upright, extended or drooping, green, with long internodes. *Leaves* opposite, simple, sessile or sub-sessile, oblong, 1–2.5 cm long and 3–4 mm across; *margin* entire or serrate. *Flow-*

Fig. 13.27b: *Diostea juncea* (Gillies ex Hook.) Miers: tree-like shape [Lago Mascardi]

ers borne in spikes, at the end of lateral twigs: *light-violet* or *whitish*; *calyx* of 5 united sepals; *corolla* tubular, slightly arched; *stamens* 4. *Fruit* composed of two united nutlets.– Fl. 10–3.

Status and distribution: Native; in Argentina: CHU, ME, NE, RN, very frequent in the PN Lanín, Nahuel Huapi, and Los Alerces; in Chile: in the central and southern regions.

Habitat: Mostly on degraded land, in the areas of transition between forest and steppe.

Elevation: 0–1000 m.

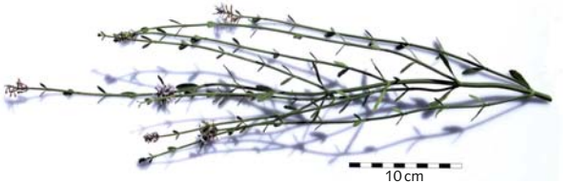


Fig. 13.27c: *Diostea juncea* (Gillies ex Hook.) Miers: branch

Fig. 13.27d: twigs of *Cytisus scoparius* (above) and *Diostea juncea (below)*

Discaria trinervis (Gillies ex Hook. & Arn.) Reiche
Syn.: *Chacaya trinervis* (Hook. & Arn.) Escal., *Colletia doniana* Clos, *Discarica doniana* (Clos) Weberb.
E: ?
Sp: Chacai, chacay
Fam. Rhamnaceae

Fig. 13.28a: *Discaria trinervis* (Gillies ex Hook. & Arn.) Reiche: shape [Trevelin]

Deciduous shrub or small tree, up to 4 m tall, richly branched and usually bearing fine, long thorns. *Leaves* opposite, simple, 1–2 cm long, shortly stalked; *blade* elliptic or oblong-lanceolate, *light green*, traced by three longitudinal veins; *margin* crenate-serrate. *Flowers* solitary or in groups of three, small, *whitish*, perfumed; *calyx* bell-shaped, with 4–5 lobes; *petals* 4–5, small; *stamens* 4–5. *Fruit* a triloculate capsule..– Fl. 9–10.

Status and distribution: Native; in Argentina: CHU. ME, NE, RN, SC, SJ; in Chile: from the mountain chain of Coquimbo (Ovalle) to that of Chillán [Region IV–VIII]; also present in the Prov. of Bío-Bío [Region VIII].

Habitat: Quite common in the areas of transition between the forest and the steppe of Neuquén and Río Negro, on sunny slopes.

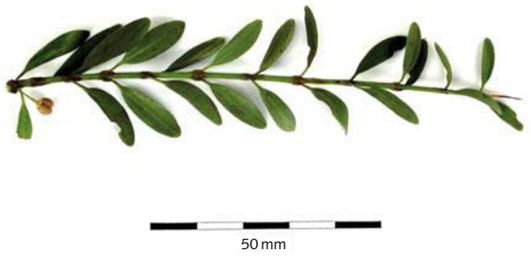


Fig. 13.28b: *Discaria trinervis* (Gillies ex Hook. & Arn.) Reiche: twig with fruit

Fig. 13.28c: *Discaria trinervis* (Gillies ex Hook. & Arn.) Reiche: leaves

Fig. 13.28d: *D. chacaye* (G. Don) Tortosa: twig

Elevation: 500–2500 m.

Remark: D. trinervis is often mixed up with *D. chacaye* (G. Don) Tortosa, but the leaves of this latter species have 5 longitudinal veins, and their margins are crenulate.

Drimys winteri J.R. Forster et G. Forster

Syn.: *Drimys chilensis* DC., *Drimys punctata* Lam.
E: Winter's bark
Sp: Canelo, canelillo, fuñe, boighe, foiye, foiyel, foike, folle, liuche, voigue
Fam. Winteraceae

Fig. 13.29a,b: *Drimys winteri* J.R. Forster et G. Forster: **a:** shape [PN El Alerce Alpino]; **b:** bark

Fig. 13.29c: *Drimys winteri* J.R. Forster et G. Forster: branch with bud

Fig. 13.29d: *Drimys winteri* J.R. Forster et G. Forster: leaves

Evergreen tree or shrub, up to 25 (30) m tall, *crown* pyramidal, often dense. *Bark* light-grey, smooth, thick, aromatic. *Leaves* alternate, simple, 5–15 cm long and 1.5–6 cm across, stalked; *blades* from ovate-oblong to elliptic, leathery, aromatic, upper side pale-green, underside bluish or whitish, with a prominent *midvein*; apex from acute to emarginate; margin entire, slightly revolute and undulate. *Flowers* in umbels or solitary, 2.5–3 cm in diameter, with reddish pedicels and a more or less cup-like receptacle; *sepals* 2–3, 5–7 mm; petals 6–15, 0.6–2 cm, white, obtuse at apex; *stamens* 20–35; *gynoecium* formed by 3–9 free carpels. *Fruits* purple-black berries, 1 cm long, with the persistent sepals. *Seeds* 3–4.5 mm, kidney-shaped, black, glossy.– Fl. 9–12.

Status and distribution: Native; in Argentina: CHU, NE, RN, SC, TF, in the PN Los Glaciares, Lanín, Nahuel Huapi, and Los Alerces; in Chile: from the river Limarí to Cape Horn (Regions IV-XII), abundant in the Isla de Chiloé.

Habitat: on moist to wet, boggy soils, on river banks. Often growing as shrub in drier areas and higher altitudes.

Elevation: 0–2500 m. A species of great ornamental value.

Fig. 13.29e: *Drimys winteri* J.R. Forster et G. Forster: flowers

Uses:

a. Wood: Not very lasting, rich in tannin, used for fine furniture.

b. In medicine: The bark contains essential oils, antibacterial substances, iron salts, and calcium salts; it has digestive properties. It has been used in the treatment of scurvy, due to its high content of vitamin C. The leaves are used against tumours and pimples. TSAM, TEM.

Remarks: Several morphological varieties of *Drimys* are adapted to different habitats. Noteworthy: *D. winteri* var. *winteri*, usually with solitary flowers having 5–7 petals; *D. winteri* var. *chilensis* (D.C.) A. Gray, an endemic variety of Chile (from the province of Limarí (Region IV) to the province of Aisén (Region XI)), generally with dense umbels of flowers having 6–14 petals; *D. winteri* var. andina Reiche (*Drimys andina* (Reiche) R.A. Rodr. et Quez.), a shrub, up to 1.5 m tall, with leaf-blades lacking revolute margins towards their bases. – *Drimys* is the sacred tree of the Araucanians.

Fig. 13.29f: *Drimys winteri* J.R. Forster et G. Forster: fruits.

Elaeagnus angustifolia L.

Syn.: *Elaeagnus argentea* Moench, *Elaeagnus hortensis* Bieb

E: Oleaster

Sp: Árbol del Paraíso, panjí, cinamomo, olivo de Bohemia

Fam. Elaeagnaceae

Fig. 13.30a: *Elaeagnus angustifolia* L.: shape [Trelew]

Tree or shrub, up to 7 (10) m tall, profusely branched. *Older branches* brown, with axillary thorns irregularly placed; *young twigs and leaves*: silvery, conveying to the whole tree a silvery-grey appearance. *Leaves* alternate, simple, 5–8 cm long, 1–2 cm across, stalked; *blade* oblong-lanceolate to lanceolate, the *upper side* greyish-green, the *underside* silvery-white; *margin* entire. *Flowers* on axillary fascicles: tubular, to 1 cm long, composed of 4 *tepals* with free lobes, *yellow* on the inner side, silvery outside; *stamens* 4; *gynoecium* with an *inferior* ovary. *Fruit* an oval drupe, 1–1.5 cm long, *yellow-reddish*, covered with silvery scales; edible.– Fl. 9–11 . Fr. 12–2.

Status and distribution: Introduced; native to central and south-west Asia.

Habitat: It prefers fresh, somewhat moist soils.

Uses: An exquisite ornamental species. In the East, the fruits are used to prepare an alcoholic beverage.

Remark: E. angustifolia reproduces itself also from root suckers and can become an invasive species (see GISD).

Fig. 13.30b,c: *Elaeagnus angustifolia* L.: **b:** twig, underside; **c:** twig, upper side

Fig. 13.30d: *Elaeagnus angustifolia* L.: leaves

Fig. 13.30e: *Elaeagnus angustifolia* L.: flowers

Embothrium coccineum J.R. Forster et G. Forster
Syn.: *Embothrium lanceolatum* Ruiz & Pav., *Embothrium valdivianum* Gand.
E: Chilean firebush
Sp: Notro, ciruelillo, fosforito, notru, ciruelillu, magú, fuinque, tremún
Fam. Proteaceae

Fig. 13.31a: *Embothrium coccineum* J.R. Forster et G. Forster: leaves (upper side above)

Evergreen tree or shrub, up to 10 m tall, *crown* irregular. Bark purple-brown, thin. Branches reddish, pubescent. *Leaves* alternate, simple, 4–10 cm long, distributed along the branches and in groups towards the tip of the shoots, shortly stalked; *blade* obovate or elliptic, leathery, *upper side* dark green to blue-green, *underside* blue-white; *margin* entire. *Flowers* in racemes, asymmetric, with long pedicels, red (including the stalk), 3–4 cm long; *tepals* 4, curled backwards; *androecium* of 4 sessile stamens; *gynoecium* with and unilocular ovary and a long arched style. *Fruit* a woody capsule with a long beak (style), releasing numerous winged seeds.– Fl. 9–2. Fr. 2–4.

Status and distribution: Native; in Argentina: CHU, NE, RN, SC, TF; in Chile: from the Prov. of Curicó to the Isla Hoste (Regions VII-XII).

Habitat: Its best development on sandy, light, and moist soils; at higher altitudes, it grows as a shrub.

Elevation: 0–1200 m.
Uses: Very appreciated as an ornamental species. In popular medicine, leaves and bark are used against neuralgia and to heal up wounds. TSAM.

Fig. 13.31b: *Embothrium coccineum* J.R. Forster et G. Forster: young branch with bud

Fig. 13.31c: *Embothrium coccineum* J.R. Forster et G. Forster: blooming branch

Fig. 13.31d: *Embothrium coccineum* J.R. Forster et G. Forster: fruits

Erythrina crista-galli L.

Syn.: *Calodendron crista-galli* (L.) Kuntze, *Erythrina fascicolata* Benth., *Erythrina laurifolia* Jacq., *Erythrina pulcherrima* Tod., *Micropteryx crista-galli* (L.) Walp
E: Cockspur, coral tree, ceibo tree
Sp: Ceibo, seibo, seibo común, sui'yva (in Guaraní; yva: fruit, sui: parrot), suiñandí (in Guaraní: rugged bark), ceibo macho, cresta de gallo, árbol de coral, fruto de loro, chopo
Fam. Fabaceae
††

Fig. 13.32a: *Erythrina crista-galli* L.: shape [Neuquén]

Deciduous tree, 3–8 m tall, having a twisted stem and an irregular crown. *Bark* dark, thick, rough, and fissured. *Young twigs* arched, drying up towards the end and becoming thin and thorny. *Leaves* alternate, trifoliate, broad, with a stalk 5–15 cm long; *blade* of lanceolate or ovate-lanceolate leaflets, the terminal one 6–14 cm long; *margin* of leaflets entire. *Flowers* solitary, in groups of 2–3 or in terminal racemes: inverse pea-like (keel above and stand-

Fig. 13.32b: *Erythrina crista-galli* L.: inflorescence

ard below in the open flower), intensely red, 4–5 cm long. *Fruit* a woody legume, somewhat curved, chestnut-brown. *Seeds* blackish, with brown spots.– Fl. 11–4. Fr. 1–4.

Status and distribution: Native to Argentina: BA, CH, COR, ER, JU, MI, SA, SE, SF, TU. In Patagonia, ornamental in more temperate regions (e.g. Neuquén).

Remark: The whole plant is poisonous, above all the seeds.

Uses in medicine: The plants of the genus *Erythrina* contain several isoquinoline alkaloids (e.g. erysonine, erysotrine, α-erythroidine), which are (curare-like) neuromuscular blocking agents. MM.

Fig. 13.32c: *Erythrina crista-galli* L.: leaf, flower, fruit

Eucalyptus L'Hér.

Fam. Myrtaceae

Evergreen trees. Bark smooth or fibrous. *Leaves* dimorphic: *juvenile* leaves opposite, sessile or shortly stalked, often glaucous (in mature trees frequently formed in response to wounding); leaves on *adult shoots* alternate, stalked, pendulous, tough, rigid, with a marked mid-vein. *Flowers* in umbels or solitary, as buds closed by the connate segments of the perianth forming a hemispherical or conical cap (operculum) which falls off as the flower opens. *Fruit* a capsule.

The genus comprises about 500 species, centred in Australia. The identification of the species is based on traits of the anthers, the bark, the operculum, and the shape of the capsule. The following synoptical key enables to identify 7 species of *Eucalyptus* grown in Patagonia.

Uses:

a. Wood: The species gathered in this manual produce wood which is used for fencing, gates, pallets, packaging, and as fuel.

b. In medicine: In *E. globulus*, the volatile oil contains above all 1,8-cineole (70%), a monoterpenoid with antihelmintic, expectorant and antiseptic activities. TAUM, TEM.

Key to 7 species of Eucalyptus

Eucalyptus camaldulensis Dehnh.
E: River red gum
Sp: Gomero rojo, eucalipto rojo, eucalipto colorado, eucalipto, eucalipto camaldulense, eucalipto rostrata

Eucalyptus cinerea F.J. Muell. ex Benth
E: Silver dollar gum
Sp: Manzano Argyle, eucalipto ceniciento

Eucalyptus coccifera Hook. f.
E: Tasmanian snow gum, Mount Wellington peppermint
Sp: Gomero de Tasmania, eucalipto

Eucalyptus dalrympleana Maiden
E: Mountain gum
Sp: Gomero de montaña, eucalipto

Eucalyptus globulus Labill.
E: Southern blue gum, Tasmanian blue gum
Sp: Eucalipto macho, eucalipto blanco, eucalipto azul, calitro, eucalipto

Eucalyptus gunnii Hook. f.
E: Cider gum
Sp: Gomero de la sidra

Eucalyptus viminalis Labill.
E: Manna gum
Sp: Gomero de cintas, eucalipto mimbreño

Characters	*E. camaldulensis*	*E. cinerea*	*E. coccifera*	*E. dalrympleana*	*E. globulus*	*E. gunnii*	*E. viminalis*
Height	40 m	16 m	10 m	60 m	70 m	30 m	50 m
Bark	white, yellow, pale grey; smooth, shedding in irregular plates; rough at base	grey and red-brown, rough, thick, fibrous, persistent	white, streaked grey; smooth	whitish, grey, yellowish, turning pink or green with age	greyish, bluish, or yellowish; smooth, shedding in large strips	*when young:* green and whitish, smooth; *when mature:* grey and reddish, shedding in narrow strips	up to 2–6 m above *base:* dark, rough; on *upper* trunk: grey, white, yellowish; smooth, shedding in ribbons
Juvenile leaves	*petiolate*, opposite, soon alternate; broadly lanceolate to lanceolate; 11 cm x 3 cm; dull grey-green	sessile, opposite for many pairs; orbicular to *broadly ovate*; 8 cm x 4.5 cm; glaucous	sessile, opposite; broadly elliptic to cordate, *apex* acute to acuminate; 2.5–4 cm x 1.5–3.5 cm	sessile, opposite; *orbicular to cordate*; 5 cm; pale green ± glaucous	sessile, opposite for many pairs; *elliptic to ovate; to 15 cm x 10.5 cm*; glaucous	sessile, opposite; orbicular to ovate; 3–5 cm x 2–4 cm; *powder-blue*	sessile, opposite; lanceolate to *broadly lanceolate; to 15 cm x 3.5 cm*; green
Adult leaves	alternate, petiolate, lanceolate; 10–20 cm x 1–2 cm; pale green	*rarely formed*, alternate, petiolate, lanceolate to slightly falcate; 7–13.5 cm x 1.5–2.5 cm; grey-green	alternate, petiolate, elliptic, *apex* cirrose *(with a tendril)*; glaucous to green	alternate, petiolate, lanceolate to falcate, usually undulate; 10–21 cm x 1–2.5 cm	alternate, falcate or lanceolate; 15–20 cm x 1.7–3 cm; glossy, green to dark green	alternate, petiolate, *lanceolate, slightly falcate; apex acute; 4–7 cm x 1–3 cm*; dull green	alternate, petiolate, *falcate* to lanceolate; 12–20 cm x 1–2 cm; green
Inflorescence	7-(5–10-) flowered; peduncle to 2 cm	3-flowered; peduncle to 0.8 cm	(3)-5–7-flowered; peduncle ± flattened, to 1 cm	3-flowered; peduncle to 0.8 cm	1-, 3- or 7-flowered; peduncle to 0.4 cm	3 -(8) flowered; peduncle to 0.8 cm	3–7-flowered; peduncle to 0.8 cm
Flower buds	pedicellate, hemispherical, *operculum* beaked	sessile, central bud shortly pedicellate, diamond-shaped, *operculum* conical	sessile or shortly pedicellate, clavate, angular or with ridges; *operculum* depressed, concave	shortly pedicellate, ovoid, *operculum* obtuse-conical	sessile or pedicellate, obconical, *operculum* flattened, umbonate, very warty; glaucous or green	shortly pedicellate,, hemispherical; *operculum* conical, acute	shortly pedicellate, fusiform or ovoid, *operculum* conical
Fruit: Capsule	hemispherical	obconical to campanulate	hemispherical to broadly turbinate truncate, smooth or with 2 ridges	cupular, obconical or hemispherical	obconical to hemispherical	campanulate to hemispherical	cupular to hemispherical
Origin	Australia	south-eastern Australia	Tasmania, mountain zone	south-eastern Australia, Tasmania	south-eastern Australia	Tasmania, south-eastern Australia	south-eastern Australia, Tasmania
Importance	one of the most widely planted *Eucalyptus*	ornamental favourite	ornamental in cold areas	ornamental in Patagonia	extended plantations in Argentina and Chile	ornamental in Patagonia	plantations, and ornamental
Hardiness	–8° C (?)	–8° C (?)	–32° C	–12° C	–8° C	–16° C	–18° C

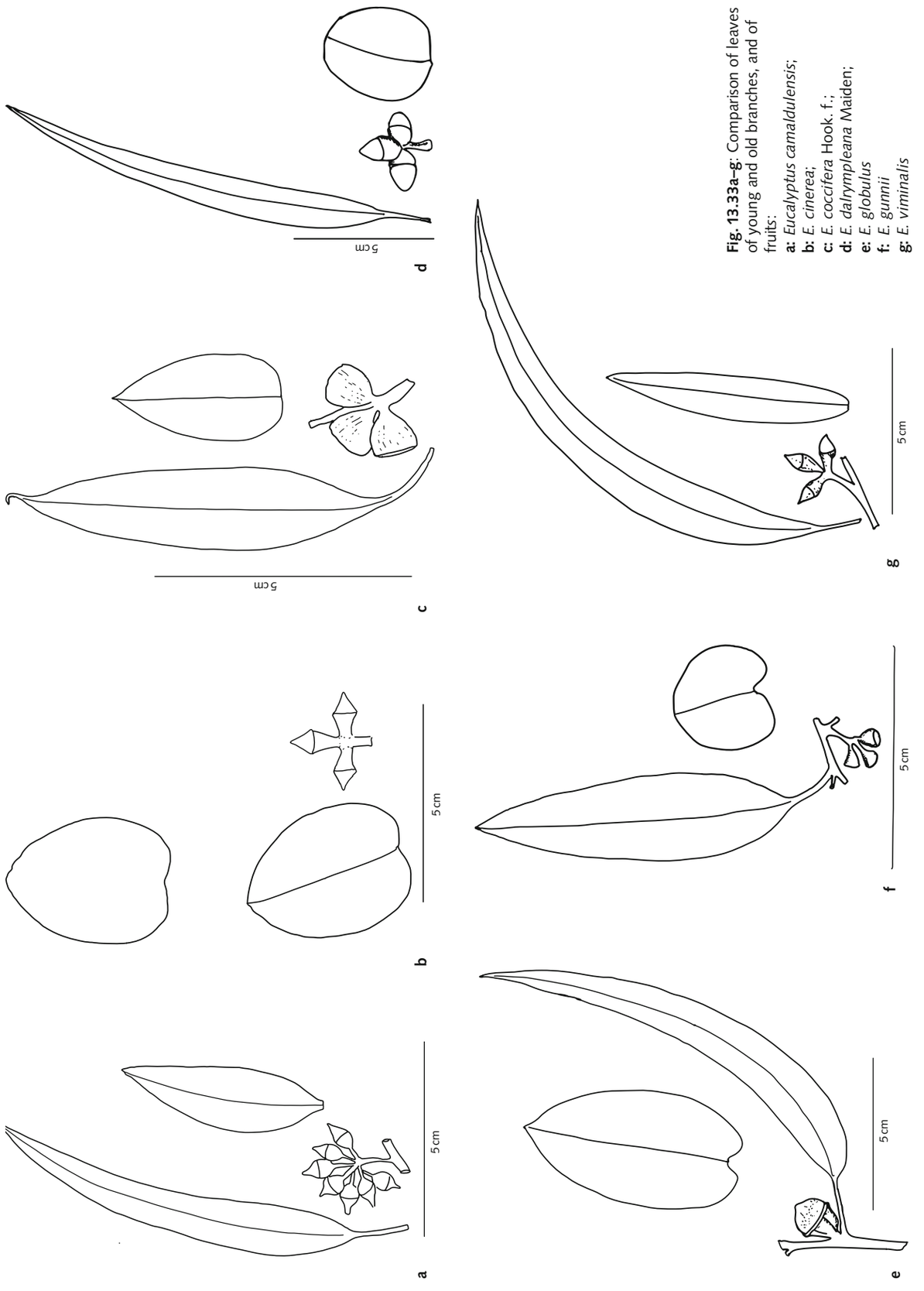


Fig. 13.33a–g: Comparison of leaves of young and old branches, and of fruits:
a: *Eucalyptus camaldulensis*;
b: *E. cinerea*;
c: *E. coccifera* Hook. f.;
d: *E. dalrympleana* Maiden;
e: *E. globulus*
f: *E. gunnii*
g: *E. viminalis*

Fig. 13.34a: *E. camaldulensis* Dehnh.: twig

Fig. 13.34b: *E. camaldulensis* Dehnh.: twigs with flowers and fruits

Fig. 13.34c: *E. camaldulensis* Dehnh.: leaves

Fig. 13.34d: *E. camaldulensis* Dehnh.: bark

Fig. 13.34e,f: *E. cinerea* F.J. Muelll. ex Benth: **e:** shape [Lago Puelo]; **f:** bark

Fig. 13.34g–i: *E. cinerea* F.J. Muelll. ex Benth: **g:** young twig; **h:** adult twig; **i:** leaf of young twig (left) and of adult twig

Fig. 13.4j,k: *E. globulus* Labill.: **j:** shape of young tree [Castro, Chiloé]; **k:** shape of mature tree [Comodoro Rivadavia]

Fig. 13.34o,p: *E. gunnii* Hook. f.: **o:** shape [Chile Chico]; **p:** bark

Fig. 13.34l–n: *E. globulus* Labill.: **l:** bark; **m:** twig; **n:** fruits

Fig. 13.34q,r: *E. gunnii* Hook. f.: **q:** twig; **r:** leaves

Fig. 13.34s,t: *E. viminalis* Labill.: **s:** shape [El Bolsón]; **t:** bark

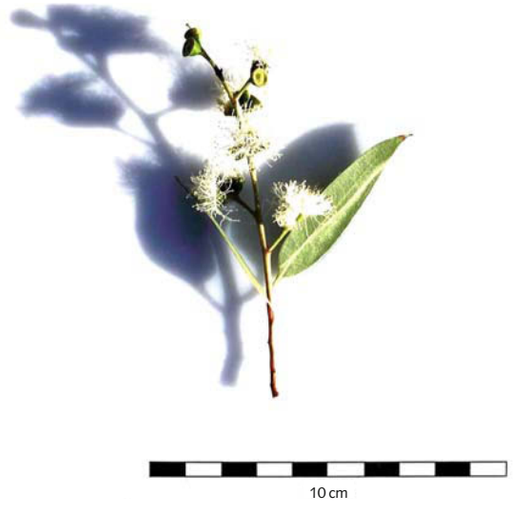


Fig. 13.34u: *E. viminalis* Labill.: twig

Fig. 13.34v: *E. viminalis* Labill.: leaves, immature fruits

Fig. 13.34w: *E. viminalis* Labill.: ripe fruits

Eucryphia cordifolia Cav.

Syn.: *Eucryphia glutinosa* (Poepp. & Endl.) Baill., *Eucryphia patagonica* Speg., *Pellinia chilensis* Molina
E: Ulmo
Sp: Ulmo, muermo, urmo, toz, voyencum
Fam. Eucryphiaceae

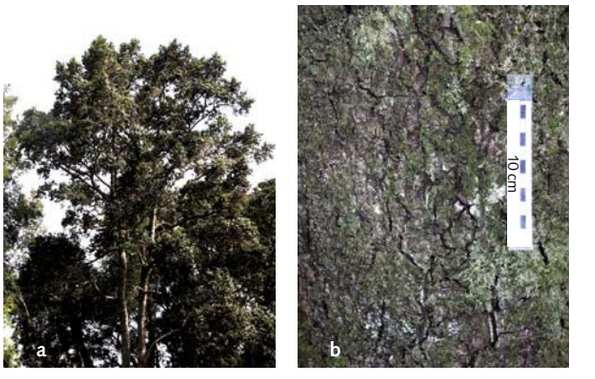


Fig. 13.35a,b: *Eucryphia cordifolia* Cav.: **a:** shape [Puerto Montt]; **b:** bark

Tree, up to 25 (40) m tall, *crown* narrowly pyramidal, densely foliated. *Bark* dark-grey, smooth, with lengthy cracks. *Branches* pubescent when young. *Leaves* opposite-decussate, simple, perennial, 2–6 cm long and 2.5–3.5 across, stalked; *blades* oblong-cordate, leathery, slightly undulate, the *upper side* dark-green, shiny, hairless, the *underside* hairy and whitish, with prominent veins; leaf *apex* obtuse or mucronate; *margin* of *lower* leaves serrate or dentate, *margin* of *upper* leaves entire. *Flowers* single, shortly pedunculate, with bracts at the basis of the peduncles; *sepals* 4, free, hairy; *petals* 4, white, 2–2.5 cm long and 1.8–2 cm across; *stamens* numerous; *gynoecium* composed of 10–18 carpels, forming a single ovary, with free

Fig. 13.35c: *Eucryphia cordifolia* Cav.: branch with fruits

styles. *Fruit* a septicidal capsule. *Seeds* winged, 2–3 per carpel-compartment.– Fl. 1–3.

Status and distribution: Native; in Argentina: CHU, NE, RN, above all in the PN Lago Puelo; in Chile: from the Prov. of Concepción to the Prov. of Chiloé (Regions VIII-X).

Habitat: Grows mainly in moist soils, rich in humus. In forests dominated by *Nothofagus dombeyi, Eucryphia cordifolia* belongs to the secondary tree-stratum, together with *Aextoxicon punctatum, Drimys winteri, Weinmannia trichosperma, Laureliopsis philippiana*.

Hardiness: –12° C.

Uses: Wood hard, heavy, rot-proof: constructions, railway-sleepers, poles. The bark is rich in tannin; flowers with abundant nectar, appreciated in apiculture ("ulmo honey", in Chile).

Fig. 13.35d: *Eucryphia cordifolia* Cav.: leaves

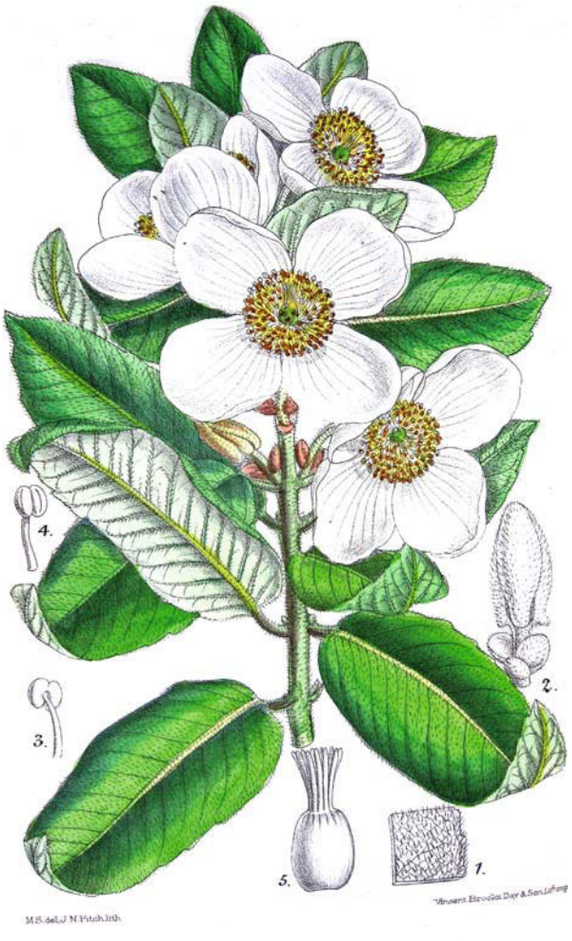


Fig. 13.35e: *Eucryphia cordifolia* Cav.: branch with flowers: **1.** part of surface of upper side of a leaf blade; **2.** bud; **3., 4.** stamens; **5.** gynoecium [O. Stapf, *Curtis's Botanical Magazine*, vol. IV of the fourth series (vol. CXXXIV of the Whole Work), London, 1908 (Bibliothek der Botanischen Institute der Universität Zürich)]

Fagus sylvatica L.

E: Common beech, European beech
Sp: Haya, fago
Fam. Fagaceae
(†)

Fig. 13.36a,b: *Fagus sylvatica* L. var. *purpurea* (Ait.) Schneid.: shape [Esquel]; **b:** shape of a fully developed tree [Rietberg Park, Zürich]

Deciduous, monoecious trees, up to 40 m tall; *crown* broad and dense, the ends of the protruding branches often comb-like. *Bark* grey, thin, smooth. *Leaves* alternate, born on two rows, to the right and left of the twig, simple, with a *petiole* 1–2 cm long and early-falling *stipules*; *blades* ovate-elliptic, 5–10 cm long and 4–7 cm across, acute, ciliate and silky, at least on the veins, *upper side* glossy dark green, *underside* paler; *margin* undulate, with silky hairs when young. *Male flowers* in pedunculate, pendulous clusters: *perianth* 4–7-lobed; *stamens* 8–16. *Female flowers* in pairs, in a pedunculate, scaly cupule: *perianth*

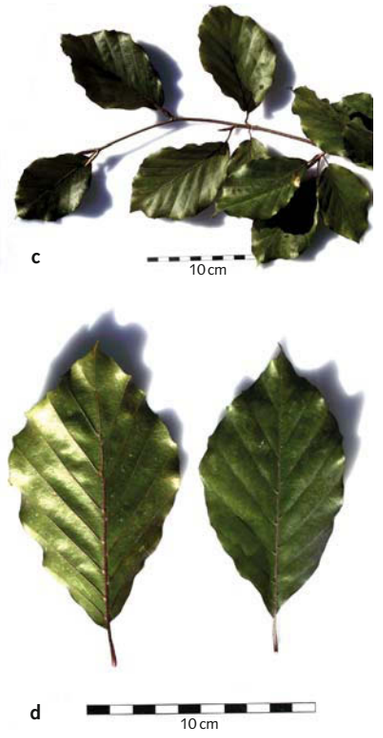


Fig. 13.36c,d: *F. sylvatica* L. var. *purpurea* (Ait.) Schneid.: **c:** twig; **d:** leaves, underside and upper side

4–5-lobed; *ovary* trilocular, *styles* 3. *Fruit* 1–2 three-sided, shiny brown nuts, 2.5 cm long, surrounded by the scaly cupule. Seeds edible, occasionally slightly poisonous.– Fl. 1. Fr. 3–5.

Status and distribution: Introduced; native to southwestern and central Europe, extending to southern Sweden.

Habitat: On well drained soils; in southern Europe, often on mountains.

Elevation: Up to 2000 m. In Patagonia, ornamental.

Hardiness: –20° C.

Remark: A large number of forms and cultivars have been propagated, the purpurea varieties, with deep red-purple foliage, being one of the favourites.

Uses:

a. Wood: For furniture, construction, sleepers, floors, tools, in fibre-boards, and as fuel.

b. In medicine: The leaves of *F. sylvatica* L. var. *purpurea* (Ait.) Schneid. contain cyanidin-3-O-galactoside, an anthocyanin with anti-inflammatory properties, used in the prevention of capillary fragility. The leaves of *F. sylvatica* L. also contain pelargonidin, an anthocyanidin with antiviral properties. The wood contains the racemate of (+)-Syringaresinol, a lignan with cytotoxic effects. TEM.

Fig. 13.36e–g: *F. sylvatica* L. var. *purpurea* (Ait.) Schneid.: **e:** bark; **f:** male fl owers; **g:** female fl owers

Fig. 13.36h: *Fagus sylvatica* L..: twig

Ficus carica L.
E: Common fig, fig tree
Sp: Higuera, higuera comestible
Fam. Moraceae

Fig. 13.37a: *Ficus carica* L.: shape [El Bolsón]

Deciduous, monoecious small tree or shrub, up to 6 (10) m tall; *crown* extended, rounded, with long, almost horizontal branches. *Bark* greyish, smooth, secreting a milky sap when wounded. *Young twigs* green, hairy. *Leaves* alternate, simple, palmatifid, with a petiole 8–10 cm long; *blade* leathery to membranous, broadly truncate or cordate at base, 20–35 cm long and as much across, with 3–5 deeply incised, ovate lobules, having an obtuse or rounded apex, *upper side* shiny dark green, *underside* pale and rough, with stiff hairs. *Male and female flowers* develop within a fleshy, green, pear-like receptacle which eventually becomes the fig.

Status and distribution: Introduced, native to south-western Asia and, perhaps, to the eastern Mediterranean region.

Habitat: It needs a dry, warm climate, with a somewhat humid soil. In Patagonia, it can grow in protected places, e.g. in walled gardens.

Hardiness: –16° C.

Remark: Flowers exclusively pollinated by *Blastophaga psenes* L., an insect. There exists, however, a cultivar, "Nottingham", which develops figs without the need for pollination.

Uses in medicine: Wood and leaves contain psoralen and bergapten, respectively, coumarins used in the treatment of leukoderma and psoriasis; psoralen has a photosensitising activity. The fruits act as a mild laxative. TEM.

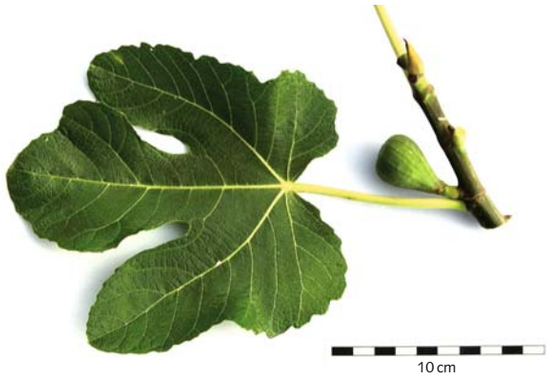


Fig. 13.37b: *Ficus carica* L.: branch with leaf and fig

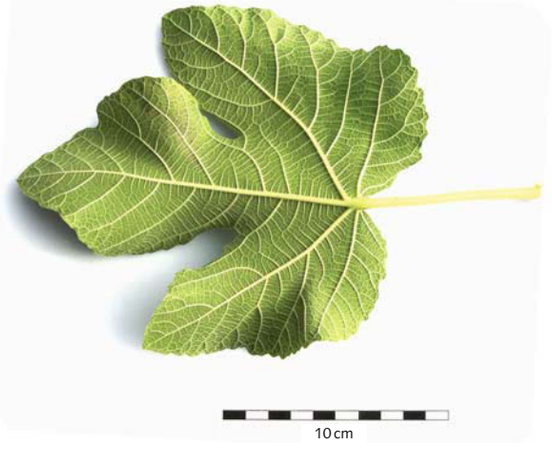


Fig. 13.37c: *Ficus carica* L.: leaf, underside

Fraxinus L.
Fam. Oleaceae

Deciduous, usually monoecious trees; *bark* fissured; leaves opposite and decussate, compound, odd-pinnate, leaflets having a serrate margin. *Flowers* on richly branched inflorescences of many units: small, usually unisexual; *perianth* either complete, or only of sepals present, or absent; *stamens* 2; *ovary* bilocular, stigma bifid. *Fruit* a 1 (-2)-seeded samara.– Fl. 10–11. Fr. 3–4.

A genus of about 65 species, native to the subtropical and temperate regions of the Northern Hemisphere. In Patagonia, cultivated mostly as ornamental plants.

Uses:

a. Wood: Of excellent quality, with numerous uses: furniture, veneers, piling, construction, handles of tools, pieces of sports equipment; also as firewood.

b. In medicine: Above all the bark of *Fraxinus* spp. contains several coumarins (e.g. esculetin, esculin, fraxetin, fraxin), some of them having bacteriostatic and antifungal activities. The bark is also used as a diuretic. TEM.

Fraxinus excelsior L.
E: Common ash, European ash
Sp: Fresno europeo, Fresno común, fresno, fresno de hoja ancha, fresno de Vizcaya, fresno grande

Fraxinus pennsylvanica Marshall
Syn.: *Fraxinus pubescens* Lam.
E: Green ash
Sp: Fresno Americano, fresno rojo, fresno verde

Fig. 13.38a: *Fraxinus excelsior* L.: branch

Characters	*Fraxinus excelsior*	*Fraxinus pennsylvanica*
Height	up to 40 m	up to 20 m
Winter buds	black, large	blackish-brown, small
Twigs	glabrous	densely pubescent
Leaves	7–15 leaflets: ovate-lanceolate, *margin* serrate, 5–11 cm long and 1.5–3.5 across; *upper side* matt, dark green, *underside* paler; leaf slightly moist to touch	7–9 leaflets: ovate-lanceolate, acuminate, *margin* remotely serrate, crenate, or entire, particularly near base, 7.5–15 cm long and 2.5–5 across; *upper side* shiny yellowish-green, *underside* paler; leaf membranous-dry; *petioles* pubescent
Fruits	samaras oblanceolate, about 3.5 cm, on dense panicles	samaras slender, 2.5–5 cm, on lax panicles
Origin	Europe	central and eastern North America
Hardiness	–32° C	–40° C

Fig. 13.38b: *Fraxinus excelsior* L.: Female flowers

Fig. 13.38c: *Fraxinus excelsior* L.: bark

Fig. 13.38d: *F. pennsylvanica* Marshall: branch

Fig. 13.38e: Comparison of *F. excelsior* and *F. pennsylvanica*: leaves, *F. excelsior* above

Fig. 13.38f: Comparison of *F. excelsior* and *F. pennsylvanica*: fruits, *F. excelsior* left

Fig. 13.38g: Comparison of *F. excelsior* and *F. pennsylvanica*: twigs, *F. excelsior* below

Gevuina avellana Molina

Syn.: *Quadria avellana* (Molina) Gaertn., *Quadria heterophylla* Ruiz & Pav

E: ?

Sp: Avellano patagónico, avellano, gevuin, guevin, nefuén, ngelu (in Mapuche)

Fam. Proteaceae

Fig. 13.39a: *Gevuina avellana* Molina: branch with flowers

Evergreen tree or shrub, up to 20 m tall; *crown* globe-shaped, irregular. *Bark* thin, greyish, with fine horizontal rings. *New branches* densely covered with reddish hairs. Leaves alternate, compound, odd-pinnate (sometimes bi-pinnate), 7–35 cm long, with hairy petioles; *leaflets* leathery, hairless, ovate, 2–4 cm long, *apex* acute, and *margin* serrate. *Flowers* in axillary racemes of 10–14 cm of length: small, having a creamy floral tube formed by 4 *tepals*; *stamens* 4; *gynoecium* unicarpellous. Fruit a nut, 1.5–2 cm in diameter, first red, violet-black when ripe.

Fig. 13.39b: *Gevuina avellana* Molina: branch with fruits

Status and distribution: Native; in Argentina: CHU, NE, RN, abundant in the north-exposed slopes of PN Lago Puelo; in Chile: from the Prov. of Curicó to the Islas Guaytecas (Regions VII-XI).

Habitat: It grows in moist soils, accompanying *Caldcluvia paniculata, Eucryphia cordifolia*, and in areas of transition, associated with *Austrocedrus*.

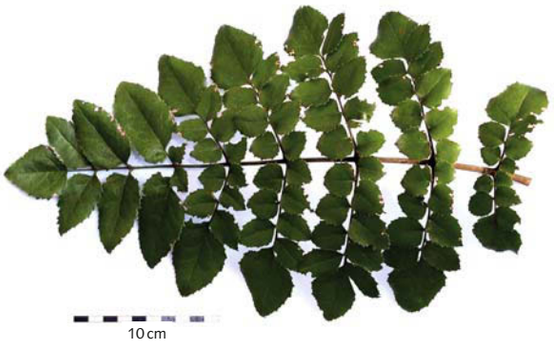


Fig. 13.39c: *Gevuina avellana* Molina: leaf

Uses: Fine, grained wood, used for fine furniture, and for musical instruments. The seed is edible, very appreciated; it is also used to prepare a beverage resembling "malt coffee". It is a species of outstanding ornamental value.

Uses in medicine: Traditionally, against diarrhoea, and to interrupt bleeding. TSAM.

Fig. 13.39d: *Gevuina avellana* Molina: bark

Gleditsia triacanthos L.

E: Honey locust, sweet locust, thorny locust, three-thorned acacia

Sp: Corona de Cristo, acacia de tres espinas, acacia de tres púas, acacia negra, espina de Cristo, algarroba turca

Fam. Fabaceae (Caesalpiniaceae)

†

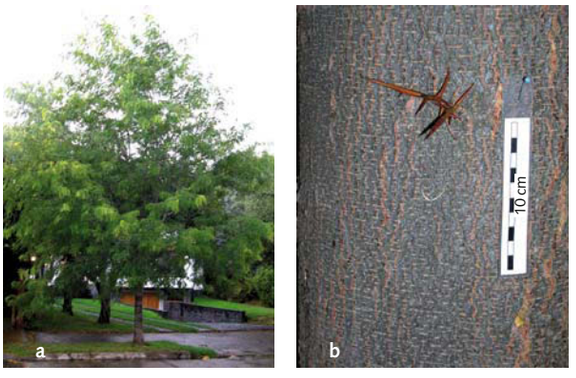


Fig. 13.40a,b: *Gleditsia triacanthos* L.: **a:** shape [San Martín de los Andes]; **b:** bark

Deciduous, polygamous-dioecious tree, up to 20 (45) m tall; *crown* broadly spreading, richly branched. *Bark* dark grey or black-grey, fissured. *Trunk* and *branches* with clusters of reddish, strong, single or branched thorns, 6–10 cm long. *Leaves* alternate, compound, *either* even-pinnate, 14–30 cm long, bearing 10–15 pairs of leaflets, or bi-pinnate, with 4–7 pairs of pinnae; *petiole* 3–5 cm long, articulate at base; *leaflets* oblong-lanceolate, 2–3.5 cm long, slightly crenate-serrate, the mid-vein of the underside pubescent. The bi-pinnate leaves have smaller leaflets. *Flowers* in spike-like, axillary racemes of 4–10 cm length: regular, yellowish-green, 3–8 mm across; *calyx* and *corolla* of 2–4 (7) similar units; in *male* flowers 5–10 free *stamens*; in *female* flowers a unicarpellate ovary. *Fruit* a brown, flat, hanging, often twisted legume, up to 45 cm long and 3–5 cm across.– Fl. 12–1. Fr. 2–6.

Fig. 13.40c: *Gleditsia triacanthos* L.: branch

Status and distribution: Introduced; native to central and eastern North America. In Patagonia, ornamental, at present planted in the more temperate areas, e.g. San Martín de los Andes.

Hardiness: –28° C.

Remark: The leaves are poisonous; the seeds are edible.

Uses: Wood of medium quality, used for fencing, pallets, packaging, and as fuel.

Fig. 13.40d: *Gleditsia triacanthos* L.: leaf

Fig. 13.40e,f: *Gleditsia triacanthos* L.: **e:** male inflorescence; **f:** female inflorescence

Fig. 13.40g: *Gleditsia triacanthos* L.: twig with fruit

Ilex aquifolium L.

Syn.: *Ilex aquifolium* var. *heterophylla* Aiton, *Ilex balearica* Desf.

E: Common holly, English holly

Sp: Acebo, acebo común

Fam. Aquifoliaceae

††

Fig. 13.41a: *Ilex aquifolium* L.: branch with flowers

Evergreen, dioecious tree or shrub, up to 8 (20) m tall; *crown* broadly columnar, dense. *Bark* greenish or ash-green, smooth. *Leaves* alternate, simple, 6–10 cm long and 3–5 across, with a flattened petiole of 1 cm length; *blade* ovate-elliptic, leathery, *upper side* glossy dark green, *underside* paler; *margin:* undulate and serrate-spiny on young plants and lower branches of tall plants, entire on upper branches of mature specimens. *Flowers* axillary, solitary or in clusters: white or purple-tinged, fragrant; *sepals* 4–5, connate at base; *petals* 4, united at base; *male flowers* with 4 *stamens; female flowers* with 4–6-locular *ovary*. *Fruit* a nearly spherical, red drupe, 7–8 mm across.– Fl. 11–12. Fr. 3–6.

Status and distribution: Introduced; native nearly throughout Europe and in western Asia.

Fig. 13.41b, Ilex aquifolium L.: *leaves*

Fig. 13.41c: *Ilex aquifolium* L.: branch with fruits

Habitat: Mainly in woods dominated by *Fagus sylvatica* or *Quercus* sp. There exist numerous varieties in leaf and fruit. A much appreciated species in gardening. In Patagonia, ornamental.

Hardiness: –20° C.

Remarks: The leaves and drupes are very poisonous; they contain above all the flavonoid rutin.– The leaves of *Desfontainia spinosa* resemble those of *Ilex aquifolium*, but are borne as opposite, decussate pairs.

Uses:

a. Wood: For cabinet making and veneers.

b. In medicine: The leaves, with flavonoids and tannins, allegedly possess tonic properties in case of fever and spasms. TEM.

Juglans regia L.
E: Common walnut, English walnut, Persian walnut
Sp: Nogal europeo, nogal, nogal común
Fam. Juglandaceae

Fig. 13.42a,b: *Juglans regia* L.: **a:** shape; **b:** bark of mature tree

Deciduous, monoecious tree, up to 30 m tall; *crown* very broad, rounded. *Bark* ash-grey, smooth, fissuring with age. *Leaves* alternate, odd-pinnate, stalked, 12.5–25 cm long; *leaflets* 5–9 (13), oval to lanceolate, leathery, 5–15 cm long, the terminal leaflet larger, olive-green on both sides, *margin* entire. *Male flowers* on long, pendulous, axillary aments: *perianth* 5–6-lobed; *stamens* 5–40. *Female flowers* solitary or in groups of 2–4, at the end of the year's twig; *ovary* inferior, crowned by the 3–4-lobed *calyx*; *stigmata* 2, arched. *Fruit* a sub-globose drupe, 4–6 cm long, green at first, becoming dark brown, with an undulated endocarp. *Seed* brain-like, edible.– Fl. 11. Fr. 3–5.

Status and distribution: Introduced; native in south-eastern Europe and western Asia.

Hardiness: – 20° C.

Uses:

a. Wood: Of excellent quality, very appreciated for cabinet making, furniture, veneers.

Fig. 13.42d: *Juglans regia* L.: male inflorescence and female flower (below)

b. In medicine: The bark contains juglone, quinine with antifungal, antiviral (against HIV-1 virus), molluscicidal and sedative activities. The leaves have astringent and anti-diarrhoeal properties. TEM.

c. Other uses: Widely cultivated for its seeds ("nuts") which contain 60–63% fat, 12–15% protein, 9–11% carbohydrates, vitamins E and B, except B_{12}.

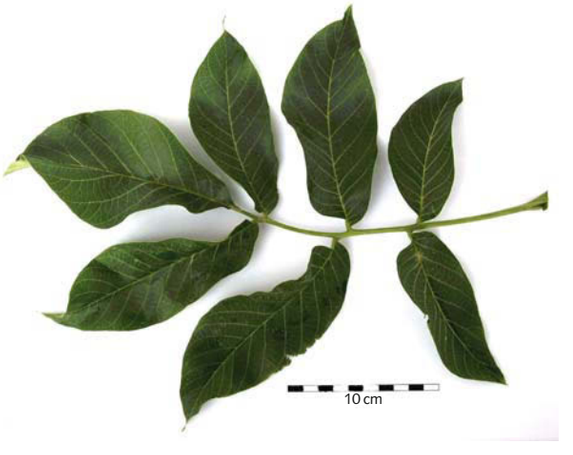


Fig. 13.42c: *Juglans regia* L.: leaf

Fig. 13.42e: *Juglans regia* L.: fruit, a drupe enclosing the edible seed

Fig. 13.43a: *Laburnum anagyroides* Medic.: inflorescence

Laburnum anagyroides Medic.
Syn.: *Laburnum vulgare* J. Presl., *Cytisus laburnum* L.
E: Golden rain, golden chain
Sp: Lluvia de oro, codeso, falso-ébano
Fam. Fabaceae
†††

Fig. 13.43b: *Laburnum anagyroides* Medic.: branch

Deciduous tree or shrub, up to 7 m tall, often branched from the very base upwards. *Bark* dark green to dark brown, blotted black. *Leaves* trifoliate, with a petiole, 2–5 cm long, pubescent when young; *leaflets* ovate to slightly obovate, 2–6.5 cm long and 1–3 across, the *upper side* glabrous, the *underside* pubescent when young. *Flowers* in pendulous racemes, up to 25 cm long: yellow, showy, butterfly-like. *Fruit* a legume.– Fl. 11–1. Fr. 2–3.

Status and distribution: Introduced; native to central and southern Europe. A species of high ornamental value.

Remarks: The entire plant is extremely poisonous; 2–3 pods or 10–20 seeds are lethal for children.– *L. alpinum* (Mill.) Bercht. et J. Presl, has glabrous immature petioles, leaves, and fruits.

Uses in medicine: Besides cytisine, leaves and fruit of *L. anagyroides* contain the isoflavones luteone and wighteone, and the stilbene piceatannol, which have antifungal properties. Cytisine is highly toxic, teratogenic in rabbits and poultry; it is a respiratory stimulant, and it is hallucinogenic. Leaves and seeds are used as emetics. TEM.

Lagerstroemia indica L
E: Crepe-myrtle, queen of shrubs
Sp: Crespón, legiste, astromelia, mirto crepe, espumilla, Júpiter, árbol de Júpiter
Fam. Lythraceae

Fig. 13.44a: *Lagerstroemia indica* L.: shape [Trelew]

Fig. 13.44b: *Lagerstroemia indica* L.: twig with flowers and fruits [W. Curtis, *The Botanical Magazine*, vol. XI, London 1797 (Bibliothek der Botanischen Institute der Universität Zürich)]

Deciduous tree or shrub, up to 10 m tall. *Bark* brown to cinnamon, smooth, even. *Young twigs* angled. *Leaves* simple, opposite to whorled, 1.5–7 cm long and 2–3.5 cm across, shortly stalked; *blade* obovate or elliptic, acute; *margin* entire. *Flowers* in 15–20 cm long terminal panicles: usually from pink to intensely red, but there are also white varieties; *calyx* of 6 lobes; *corolla* of 6 obovate, ridged; *stamens* numerous. *Fruit* a capsule of 0.8–1.2 cm in diameter. *Seeds* winged.– Fl. 11: Fr. 3–4.
Status and distribution: Introduced; native to China and Korea.–
Hardiness: –17° C.
Remarks: A very ornamental species, requiring sun and moist, well drained soil

Laureliopsis philippiana (Looser) Schodde
Syn.: *Laurelia philippiana* Looser, *Laurelia serrata* Phil.
E: Chilean tepa
Sp: Tepa, huan-huán, hua-huam, guanguan, laurela, vauván
Fam. Atherospermataceae

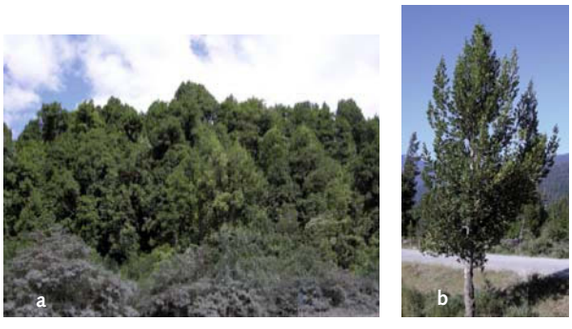


Fig. 13.45a,b: *Laureliopsis philippiana* (Looser) Schodde:
a: remnants of a Laureliopsis forest [near La Junta, Chile];
b: shape of a young tree [La Junta]

Evergreen, polygamous-monoecious or dioecious tree, up to 20 (30) m tall. *Bark* light-grey, thin. Leaves opposite, simple, perennial, 5–12 cm long and 2.5–4 across, shortly stalked; *blades* oblong-lanceolate or lanceolate, leathery, shiny green, smooth, the *underside* with the midvein covered with yellow hairs; *margin* serrate, with a gland on the tip of each tooth. The leaves exhale an aromatic scent when broken. *Flowers* in axillary cymes of 3–9 units: green, pedunculate; *tepals* in two whorls, 3–4 mm long; *male flowers* with 4 stamens and 4 staminodes; *female and hermaphroditic flowers* with 24–28 staminodes and stamens (in the hermaphroditic ones); *gynoecium* composed of several free carpels having *inferior* ovaries. *Fruit* free achenes within the hypanthium.– Fl. 9–12. Fr. 1–2.

Status and distribution: Native; in Argentina: CHU, NE, RN, quite common between Puerto Blest and Lago Frías; in Chile: from the Prov. of Arauco to the Prov. of Aisén (Regions VIII-XI).

Habitat: It grows in humid areas and on deep soils. It associates e.g. with *Drimys winteri, Embothrium coccineum, Eucryphia cordifolia, Lomatia ferruginea, Nothofagus dombeyi, Weinmannia trichosperma.*

Elevation: 0–1000 m.

Uses:

a. Wood: Of a whitish tone, easy to handle, used in construction, for furniture, boxes, etc. The wood emanates a strong, persistent odour, especially when soaked.

b. In medicine: Leaves and stem contain dillapiole, a phenylpropanoid with insecticide and molluscicide properties.

Fig. 13.45c: *Laureliopsis philippiana* (Looser) Schodde: bark

Fig. 13.45d: *Laureliopsis philippiana* (Looser) Schodde: twig with flowers

Fig. 13.45e: *Laureliopsis philippiana* (Looser) Schodde: leaves

Remark: Laurelia sempervirens (R. et P.) Tul., an endemic species of Chile, differs from *Laurelopsis philippiana* in having leaves with softly toothed margins.

Fig. 13.45f,g: *Laurelia sempervirens* (R. et P.) Tul.: **f:** shape [Valdivia]; **g:** bark

Fig. 13.45h: *Laurelia sempervirens* (R. et P.) Tul.: twig

Fig. 13.45i: *Laurelia sempervirens* (R. et P.) Tul.: leaves

Fig. 13.45j: Comparison of leaves: *Laurelia sempervirens* (left) and *Laureliopsis philippiana*

Laurus nobilis L.

E: Bay laurel, sweet bay, poets' laurel, bay tree
Sp: Laurel, laurel común, laurel de condimento, laurel de olor
Fam. Lauraceae

Fig. 13.46a: *Laurus nobilis* L.: twig with flowers

Evergreen, polygamous-dioecious tree, up to 10 m tall; *crown* dense, conical, somewhat irregular. *Leaves* alternate, simple, 8–10 cm long and 2–4 across, petiole up to 1 cm; *blade* elliptic-lanceolate or lanceolate, leathery, smooth, aromatic, glabrous, *upper side* glossy dark green, *underside* paler, *margin* entire, undulate, crisp. *Flowers* on axillary umbels: yellow, small; *male* flowers with 2 sepals and 2 similar petals, and about 12 stamens; *female* flowers with 2–4 staminodia and an ovoid ovary. *Fruit* drupaceous, ovoid, 1–1.5 cm long, black.

Status and distribution: Introduced; native to the Mediterranean region.

Habitat: Evergreen woods, thickets, rocks. In Patagonia, ornamental, in warmer, protected places.

Hardiness: –16° C.

Fig. 13.46b: *Laurus nobilis* L.: leaves

Uses:

a. Wood: For cabinet making and decorative work.

b. In medicine: Bark and wood contain actinodaphnine, an aporphine with antimicrobial properties. *Laurus* also contains the sesquiterpene lactone costunolide, with antitumour activity and is active against the trematode *Schistosoma mansoni*, which causes schistosomiasis. The leaves have digestive and tonic properties. TEM.

Fig. 13.47a: *Ligustrum lucidum* Ait.: shape [Trelew]

Ligustrum lucidum Ait.

Syn.: *Ligustrum japonicum* auct. eur., non Thunb.
E: Chinese privet, glossy privet
Sp: Ligustro, aligustre de China, aligustrón, aligustre de Japón, aligustre reluciente
Fam. Oleaceae

Evergreen small tree, up to 15 m tall. *Bark* grey, smooth. *Leaves* opposite, decussate, 7.5–15 cm long and 2.5–3.5 across, *petiole* 0.6–1.2 (2) cm long; *blade* ovate, leathery, *apex* tapering or pointed, *base* cuneate, *upper side* glossy dark green, *underside* paler; *margin* entire. *Flowers* in pyramidal panicles, 15–20 cm long: white; *calyx* persistent, 4-lobed; *corolla* tubular, 4-lobed; *stamens* 2; *ovary* bilocular. *Fruit* a sub-globose, blue-black drupe, 0.8–1.2 cm across.– Fl. 12–1. Fr. 3–6.

Status and distribution: Introduced, naturalized in certain regions, e.g. Buenos Aires; native to China and Corea. In Patagonia, ornamental, in warmer regions.

Hardiness: –8° C.

Uses: The wood is used for cabinet making and for decorative purposes.

Remark: L. lucidum is able to grow in various habitats and can become a noxious weed (see GISD).

Fig. 13.47b: *Ligustrum lucidum* Ait.: twig with inflorescence

Fig. 13.47c: *Ligustrum lucidum* Ait.: twig

Fig. 13.47d: *Ligustrum lucidu*m Ait.: leaves

Liriodendron tulipifera L.

E: Tulip tree, tulip poplar, whitewood, yellow poplar
Sp: Tulipanero, tulipero de Virginia, árbol de los tulipanes, tulipífero americano, árbol de las tulipas
Fam. Magnoliaceae
(†)

Fig. 13.48a,b: *Liriodendron tulipifera* L.: **a:** shape [Dornach, Switzerland]; **b:** bark

Deciduous tree, up to 60 m tall; *crown* pyramidal, becoming broader and opener with age. *Bark* at first brown, thin and scaly, getting darker, thick and deeply furrowed in old specimens. *Branches* somewhat tortuous, marked by the scars of the fallen leaves. *Leaves* alternate, simple, 7.5–20 cm long, the petiole having a length of 5–10 cm; *blade* trapeze-like, with two, not very deeply incised, pointed lobes on each side, the *upper side* dark, glossy green, the *underside* paler; *apex* truncate to broadly emarginate; *base* rounded-cuneate. *Flowers* tulip-like, terminal, solitary, 4–5 cm long; *tepals* 9, the 3 exterior reflexed, greenish-white, caducous, the 6 interior yellowish-green, stained orange at the base; *stamens* numerous; *gynoecium* of numerous carpels, arranged in a central column. *Fruit* elongated, 6–8 cm woody samaras. – Fl. 11–12. Fr. 1–3.

Status and distribution: Introduced; native to eastern North America.

Habitat: In valleys, between streams, on slopes with deep, moist soils.

Elevation: Up to 1500 m. In Patagonia, ornamental.

Hardiness: –20° C.

Remark: The whole plant is slightly poisonous.

Uses:

a. Wood: For furniture as well as for fencing, gates, packaging, and in fibre-boards.

b. In medicine: Root bark and leaves contain several sesquiterpene lactones (e.g. lipiferolide, tulipinolide) with cytostatic, antitumour and anti-fever activities. The bark contains also acanthoside D, a lignan with stress-reducing properties, and scoparone, a chromone with antihepatotoxic properties and (probably) effects on heart beat activity. The alkaloid liriodenine has antifungal properties and – *in vitro* – is cytotoxic to certain carcinoma cells. TNAM.

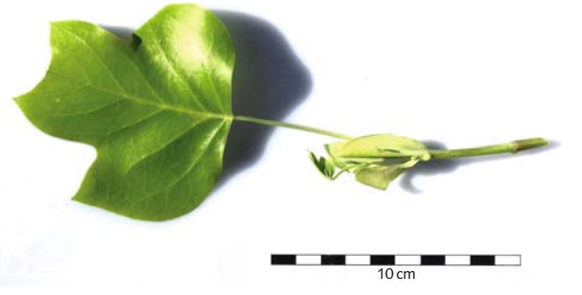


Fig. 13.48c: *Liriodendron tulipifera* L.: twig

Fig. 13.48d: *Liriodendron tulipifera* L.: flower

Lomatia ferruginea (Cav.) R. Br.
Syn.: *Embothrium ferrugineum* Cav., *Tricondylus ferrugineus* (Cav.) Salisb. & Knight
E: Lomatia
Sp: Fuinque, huinque, hiunque, romerillo, helecho de árbol, more, plume, pinue, piúne, palmilla
Fam. Proteaceae

Fig. 13.49a: *Lomatia ferruginea* (Cav.) R. Br.: twig

Evergreen, richly branched tree or shrub, up to 8 m tall. *Young branches* densely orange-reddish tomentose. *Leaves* opposite, bipinnate and odd-pinnate, stalked, 7–20 cm long and 5–12 cm across; *blades* leathery, *upper side* dark green, nearly glabrous, *underside* light green, with appressed hairs; *secondary leaflets* ovate-elliptic, somewhat asymmetric, pointed; rachis channelled, densely tomentose. *Flowers* in racemes of 4–8 cm length, orange-yellow. *Fruit* a black follicle. *Seeds* with a truncate wing.– Fl. 9–2.
Status and distribution: Native; in Argentina: CHU, NE, RN, SC, especially in the PN Lanín, Nahuel Huapi, and Los Alerces; in Chile: from the south of Río Bío-Bío to the Prov. of Última Esperanza (Regions VIII-XII).

Fig. 13.49b: *Lomatia ferruginea* (Cav.) R. Br.: leaf, underside

Fig. 13.49c: *Lomatia ferruginea* (Cav.) R. Br.: leaf, upper side

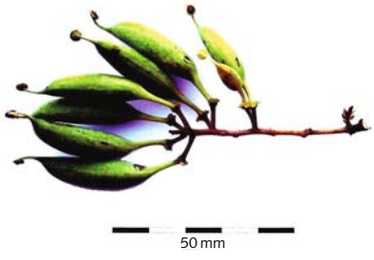


Fig. 13.49d: *Lomatia ferruginea* (Cav.) R. Br.: fruits

Fig. 13.49e: *Lomatia ferruginea* (Cav.) R. Br.: leaf bud

Habitat: Moist, shady places, e.g. gorges. It associates with *Drimys winteri, Laureliopsis philippiana, Luma apiculata, Amomyrtus luma, Laurelia sempervirens* (in Chile), among other species.
Elevation: 0–500 m.
Uses:
a. Wood, etc.: Grained wood, appreciated for fine furniture.– A species of ornamental value.
b. In medicine: Lomatia ssp. contain juglone (see entry in *Juglans regia*).

Lomatia hirsuta (Lam.) Diels ex J.F. Macbr.
Syn.: *Embothrium alnifolium* Poepp. ex Meisn., *Embothrium hirsutum* Lam., *Lomatia obliqua* (Ruiz & Pav.) R. Br.
E: Radal
Sp: Radal, raral, ral-ral, rairal, nogal silvestre, nogal del sur, rabral, nogal
Fam. Proteaceae

Fig. 13.50a: *Lomatia hirsuta* (Lam.) Diels ex J.F. Macbr.: shape [PN Los lerces]

Evergreen tree or shrub, up to 15 m tall; *crown* spherical. Bark light-grey, thin, with dark patches. *Young branches* rust-coloured, hairy. *Leaves* alternate, simple, 4–12 cm long and 3–5 across, with a slightly channelled petiole, 2–5 cm long; *blade* ovate, leathery, glabrous, *upper side* dark green, shiny, *underside* brighter, with prominent veins; *margin* crenate-serrate. *Flowers* in axillary, rusty, racemes of

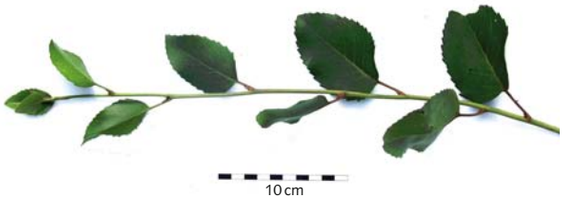


Fig. 13.50b: *Lomatia hirsuta* (Lam.) Diels ex J.F. Macbr.: twig

Fig. 13.50c: *Lomatia hirsuta* (Lam.) Diels ex J.F. Macbr.: leaves, underside

Fig. 13.50d: *Lomatia hirsuta* (Lam.) Diels ex J.F. Macbr.: leaves, upper side

8–16 units, shorter than the leaves: yellowish-white, with a hairy peduncle; *tepals* 4; *stamens* 4, over the tepals; *gynoecium* unicarpellate, pluriovulate. Fruit a grey-black follicle, 2–4 cm long. *Seeds* with a truncate wing.– Fl. 10–12.
Status and distribution: Native; in Argentina: CHU, NE, RN, frequent in the PN Lanín, Nahuel Huapi, and Los Alerces; in Chile: from Coquimbo to Chiloé (Regions IV-X). Hábitat: It grows under various conditions of soil and humidity. In the more humid areas, it associates with e.g. *Drimys winteri, Laureliopsis philippiana, Persea lingue, Weinmannia trichosperma, Laurelia sempervirens* (in Chile).

Fig. 13.50e,f: *Lomatia hirsuta* (Lam.) Diels ex J.F. Macbr.: **e:** bark; **f:** flowers

Elevation: 0–500 m.

Remark: An endemic species of Chile is *Lomatia dentata* (R. et P.) R. Br.; it differs from *L. hirsuta* by having smaller leaves (up to 4.5 cm long), with sharp teeth in their upper part.

Uses:

a. Wood etc.: Grey, soft, grained, used for fine furniture. Bark used to dye brown.

b. In medicine: The species belonging to the genus *Lomatia* contain juglone (see entry in *Juglans regia*). In popular medicine, the bark is used against asthma; its infusion is a purgative. TSAM.

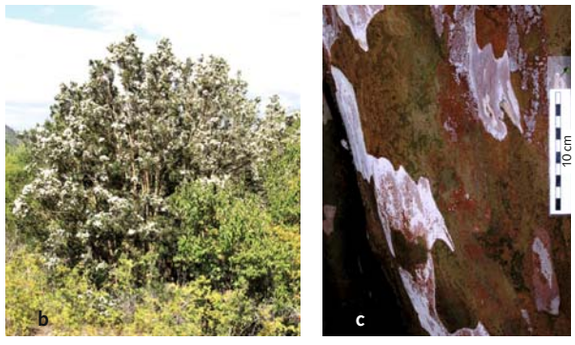


Fig. 13.51b,c: *Luma apiculata* (DC.) Burret: **b:** shape [Lago Puelo]; **c:** bark

Luma apiculata (DC.) Burret

Syn.: *Eugenia apiculata* DC., *Eugenia proba* O. Berg, *Myrceugenella apiculata* (DC.) Kausel, *Myrceugenia apiculata* (DC.) Nied.
E: Myrtus luma, orange-barked myrtle
Sp: Arrayán rojo, arrayán, palo colorado, temu, quetri, cuthú, collimamil, collimamol
Fam. Myrtaceae

Fig. 13.51d: *Luma apiculata* (DC.) Burret: flowers

Fig. 13.51a: *Luma apiculata* (DC.) Burret: Luma growing on the shore of Lago Verde; PN Los Alerces

Evergreen tree or shrub, up to 15 (20) m tall; *crown* spherical, richly branched. Bark smooth, silky, wine-red or cinnamon-orange and greyish green, flaking in plaques that leave nearly white patches when freshly exposed. *Young branches* rusty pubescent. *Leaves* opposite, simple, 1.2–3.5 cm long and 1–2.3 across, shortly petiolate; *blade* ovate to orbicular, leathery, glanduliferous, aromatic, *upper side* dark green and shiny, *underside* paler; apex mucronate; *margin* entire, slightly revolute. *Flowers* in axillary dichasia of few unities, white, 1.5 cm in diameter, stalked; *sepals* 4; *petals* 4, 7–9 mm long, membranous; *gynoecium* with an *inferior* bilocular, pluriovulate ovary. Fruit a black berry, edible; also used to prepare chicha, a sort of vine.– Fl. 1–5. Fr. 2–5.

Status and distribution: Native; in Argentina: CHU, NE, RN; in Chile: from the Prov. of Valparaíso to the Prov. of Aisén (Regions V-XI).

Habitat: Hygrophilous species, bordering lakes, rivers, and on other very moist soils. It associates e.g. with *Drimys winteri, Eucryphia cordifolia, Gevuina avellana, Lomatia ferruginea, Nothofagus dombeyi, Weinmannia trichosperma.*

Elevation: 500–1100 m.– *Luma* is a species of outstanding ornamental value.

Uses:

a. Wood etc.: Hard, resistant wood, used for handles of tools, and as firewood. A species planted to protect watercourses.

Fig. 13.51e: *Luma apiculata* (DC.) Burret: fruits

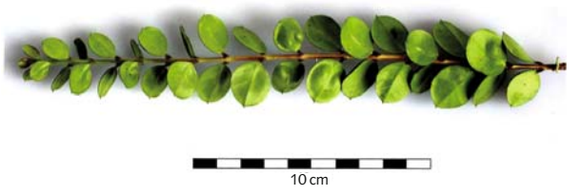


Fig. 13.51f: *Luma apiculata* (DC.) Burret: twig, underside

Fig. 13.51g: *Luma apiculata* (DC.) Burret: twig, upper side

b. In medicine: Contains phenolic acids with antihaemorrhagic activity. *Luma* had various medicinal applications with the Mapuches: as an astringent (root), to treat herpes and ulcers (bark), as a stimulans and to cure wounds (leaves), and to treat stomach disorders (sap of the stem). TSAM.

Magnolia grandiflora L.

E: Bull bay, southern magnolia, laurel magnolia
Sp: Magnolia, magnolio
Fam. Magnoliaceae

Fig. 13.52a: *Magnolia grandiflora* L.: shape [Neuquén]

Evergreen tree, up to 30 m tall; *crown* dense, broadly pyramidal. *Bark* grey or slightly brown, breaking into plates. *Twigs and buds* rusty-pubescent. *Leaves* simple, alternate, 15–25 cm long and 6–9 across, with petiole 2–4 cm long; *blade* leathery, elliptic to ovate or lanceolate; *upper side* smooth, glossy dark green; *underside* rusty hairy, especially in young leaves; *margin* entire. *Flowers* solitary, terminal, cup-like, bright and fragrant, up to 25 cm in diameter; with 9–12 (14) creamy-white, fleshy *tepals*. *Fruit* ovoid, symmetrical, 6–12 cm long, covered with short reddish hairs. *Seeds* red.– Fl. 9–11. Fr. 11–3.

Status and distribution: Introduced, native to the Southeast of the U.S.A. In Patagonia, above all in temperate areas.

Hardiness: –17° C.

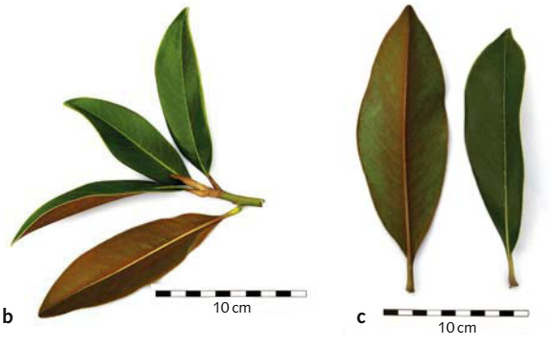


Fig. 13.52b,c: *Magnolia grandiflora* L.: **b:** branch; **c:** leaves

Uses in medicine: The bark contains alcaloids (magnoflorine and other aporphines), with antimicrobial properties and active against malaria and amoeba parasites. The flowers contain cineol and sesquiterpenes, are aromatic and used against rheumatism. TNAM, TCM.

Fig. 13.52d: *Magnolia grandiflora* L.: flower

Fig. 13.52e: *Magnolia grandiflora* L.: open flower, with creamy stamens, and numerous carpels, with yellowish styles, arranged spirally on the floral axis (receptacle)

Malus domestica Borkhausen

E: Cultivated apple, orchard apple
Sp: Manzano común, manzano
Fam. Rosaceae
(†)

Fig. 13.53a: *Malus domestica* Borkhausen: flowers

Deciduous tree, up to 12 m tall; *crown* broadly spreading. *Bark* grey-brown to purple-brown, peeling in thin flakes. *Twigs* tomentose. *Leaves* alternate, simple, 4–13 cm long and 3–7 across, petiole to 2 cm; *stipules* early-falling; *blade* ovate-elliptic, slightly leathery, *upper side* dark green and slightly tomentose, *underside* paler and often densely tomentose; *base* rounded, rarely cordate; *margin* crenate to finely serrate. *Flowers* in short, umbellate racemes: variable in colour, usually white with reddish streaks or blotches, to 5 cm across; calyx 5-lobed, on the rim of the receptacle; *petals* 5; *stamens* 50–15; *ovary* inferior, 5–3-locular, *styles* 5–2, connate at base. *Fruit* pomaceous (apple), fleshy,

Fig. 13.53b: *Malus domestica* Borkhausen: twig, underside

Fig. 13.53c: *Malus domestica* Borkhausen: twig, upper side

more than 5 cm across, mostly with the persistent calyx; fruit edible, sweet to sour.– Fl. 11–12. Fr. 2–6.

Status and distribution: Introduced; of garden origin, a hybrid involving several species native to south-eastern Europe and western Asia. In Patagonia, cultivated down to approximately 47° S; naturally spreading along roads and paths.

Hardiness: –28° C.

Remark: The seeds are slightly poisonous.

Uses:

a. Wood: For furniture (e.g. tables) and as firewood.

b. In medicine: The fruits are used against diarrhoea and dyspepsia. TEM.

Fig. 13.53d: *Malus domestica* Borkhausen: leaves

Maytenus boaria Mol.
Syn.: *Maytenus chilensis* DC.
E: Maiten
Sp: Maitén, maitén grande, horco-molle (en Córdoba), sauce patagónico, naranjita, huayo (en mapuche)
Fam. Celastraceae

Fig. 13.54a: *Maytenus boaria* Mol.: shape [Lago Rosario]

Evergreen, polygamous-monoecious tree, up to 25 m tall; *crown* rounded, densely foliated. *Fine twigs* hanging. *Leaves* alternate, single, 2–6 cm long and 0.5–2 cm across, with a short petiole and deciduous stipules; *blade* lanceolate-elliptic; *apex* and *basis* acute; *margin* serrate. *Flowers* axillary, in groups or solitary, small, yellowish-green. *Fruit* a capsule with two valves. *Seeds* 2, enveloped by a fleshy, *red* aril.– Fl. 8–9.

Status and distribution: Native; in Argentina: CHU, CO, ME, NE, RN, SC, SL, TF; in Chile: from the Prov. of Huasco to the Prov. of Chiloé (Regions III-X).

Habitat: It prefers semiarid areas of transition and not very moist soils near rivers or marshes.

Elevation: 0–4000 m. (*Maytenus* can also be found in Bolivia and Brazil.)

Fig. 13.54b: *Maytenus boaria* Mol.: bark

Fig. 13.54c: *Maytenus boaria* Mol.: branch

Fig. 13.54d: *Maytenus boaria* Mol.: leaves, upper side and under side

Remark: Another species belonging to the same genus is *M. magellanica* (Lam.) Hook. f., usually growing as a shrub; it differs from *M. boaria* by its fine twigs, which are firm, erect, and by the seeds, which have a *yellowish* aril on their lower part.

Uses:

a. Wood: Hard, having few applications.

b. Other uses: The tender leaves are also eaten as salads. Cattle feed on the young shoots and leaves.

c. In medicine: Several species of the genus *Maytenus* contain the tripertenoid pristimerin, with potent anti-tumour activitiy and antibacterial properties. The leaves are used against fever and as a purgative. TSAM.

Fig. 13.54e: *Maytenus magellanica* (Lam.) Hook. f.: shape [Punta Arenas]

Fig. 13.54f: *Maytenus magellanica* (Lam.) Hook. f.: twig

Fig. 13.55b: *Melia azedarach* L.: leaves, underside and upper side

Melia azedarach L.

E: Persian lilac tree, chinaberry, China tree, azedarach, pride of India
Sp: Paraíso, árbol santo, árbol del Paraíso, agriaz, melia, falso cinanomo, cinanomo, árbol de los rosarios, palo de lila, lila de la China, lila de la India, melia, jabonero de las Antillas, revienta caballos
Fam. Meliaceae
†

Fig. 13.55a: *Melia azedarach* L.: leaves and fruits

Deciduous tree, up to 15 m tall; *crown* rounded, dense. *Bark* grey to chestnut-red, dark, longitudinally fissured. *Leaves* alternate, bi-pinnate or tri-pinnate, up to 45 cm long, with 3–4 *odd*-pinnate pinnae which in their turn carry 2–3 pairs of opposite, ovate-oblong *leaflets*, 5–10 cm long, their *margin* entire or serrate towards the apex. *Flowers*, borne in axillary panicles which are shorter than the leaves: violet, scented, 1.5–2 cm across; *calyx* of 5–6 united sepals; *petals* 5–6, free, overlapping; *stamens* 10–12, their filaments united to a tube; ovary superior, composed of 5 united carpels. *Fruit* an ellipsoidal, yellow drupe, 1–1.5 cm across, that remains for long on the tree.– Fl. 9–11. Fr. 12–3.

Status and distribution: Introduced; native to subtropical Asia. In Patagonia, ornamental in the more temperate regions (e.g. Neuquén).

Uses:

a. Wood: For cabinet making, veneers, floors; also as firewood.

b. In medicine: The bark contains saponins (e.g. vanillic acid, with antihelmintic activities). The entire plant is poisonous, especially its fruits which contain bakayanine, melaniol and melantriol (with antifeedants, i.e.repellent effects against grasshoppers), and tetranortriterpene neurotoxins. The ingestion of 6–8 fruits can cause the death of a human. Leaves, barks, and fruits are used as insecticides. Extracts are also reported to have anti-viral properties. TIM

Remark: The species spreads also through root suckers and is an invasive weed in certain areas (see GISD).

Misodendron sp. Banks ex DC.

E:?
Sp: Liga, injerto
Fam. Misodendraceae

Fig. 13.56a: *Misodendron* sp. Banks ex DC.: shape

Hemiparasitic shrubs, usually dioecious, that grow on *Nothofagus antarctica, N. betuloides, N. dombeyi, N. pumilio* and *Caldcluvia paniculata*. Leaves alternate, simple, linear-oblong to lanceolate. *Flowers* borne on aments with bracts: small, without perianth; the *male* ones having 2–3 stamens; the *female* flowers bearing a tricarpellate ovary. *Fruit* an achene with three long, hairy setae.– Fl. 8–2. Fr. 1–2.

Status and distribution: Native; in Argentina: CHU, NE, RN, SC, TF; in Chile: from the Aconcagua to Chiloé.

Remark: The *Misodendron* penetrate the tissues of the plants they grow on through a root-like haustorium.

Morus alba L.

E: White mulberry
Sp: Morera, morera blanca
Fam. Moraceae

Fig. 13. 57a: *Morus alba* L.: shape [Los Antiguos]

Deciduous, monoecious or dioecious small tree, up to 15 m tall; *crown* broad, usually rounded, richly branched. *Bark* light grey, turning fissured with age, developing short, vertical ribs. *Young twigs* hairy. *Leaves* alternate, simple, with a petiole 2–4 cm long; *blade* membranous, variable in shape and size, though generally somewhat asymmetric, ovate, sometimes slightly 3–lobed, 6–18 cm long

Fig. 13. 57b: *Morus alba* L.: bark

and 5–10 cm across, broadly truncate or cordate at *base*, usually obtuse or rounded at *apex*; *upper side* glabrous and shiny green, *underside* pale, with scarce stiff hairs on the veins and at their angles; *margins* with rounded, rather blunt teeth. *Male and female flowers* in short, dense spikes. The perianth of the female flowers becomes fleshy in the fruits which join to form syncarps resembling elongated blackberries. Syncarps 1–2.5 cm long, white, pinkish or black–purplish, having a 1–2 cm long peduncle. Syncarps

Fig. 13. 57c: *Morus alba* L.: twig with leaves and syncarps

Fig. 13. 57d: *Morus alba* L.: leaves, underside and upper side

edible already before being ripe, sweet, but somewhat insipid.

Status and distribution: Introduced, native to India and Central Asia. It has been widely cultivated to feed silkworms. It is also quite popular as a roadside tree. In Patagonia, it can grow in warmer areas (e.g. Los Antiguos) and in protected places.

Hardiness: –20° C.

Remarks: Its wood has been used for plugs, stakes, and for furniture.– *M. nigra* L. (E: black mulberry; Sp: moral, morera negra), native to Iran and adjacent regions, is a closely related species, with pubescent leaves on the underside and subsessile, black to dark purple syncarps which taste very sweet when ripe, but acid when unripe.

Uses in medicine: Bark, leaves, and syncarps contain flavonoids, anthocyanins, pectins, sugars, artocarpin. The leaves, above all, are used as an expectorant. TCM.

Myrceugenia exsucca (DC.) O. Berg
Syn.: *Eugenia exsucca* DC., *Eugenia multiflora* Hook. & Arn., *Luma exsucca* (DC.) Burret, *Myrceugenia multiflora* (Hook. & Arn.) Kausel
E: ?
Sp: Petra, pitra, patagua, temu, picha, peta, petra (in Mapuche)
Fam. Myrtaceae

Fig. 13.58a: *Myrceugenia exsucca* (DC.) O. Berg: shape [Lago Puelo]

Evergreen tree or shrub, up to 15 m tall; *crown* richly branched. *Stem* deeply fissured, conveying it the appearance of a bundle of thick branches. *Bark* smooth, dark red, with thin, irregular plates. *Young branches* tomentose. *Leaves* opposite, simple, 2.5–7 cm long and 2.5–4 across; *blades* oval-oblong or elliptic, dark green on the *upper side*, yellowish-green on the *underside*, with marked veins; *margin* entire. *Flowers* in axillary cymes or solitary: white, aromatic, 8–10 mm in diameter; *sepals* 4; *petals* 4; *stamens* numerous; *gynoecium* with an *inferior* ovary, 2–3 loculate, with one style. *Fruit* a spherical, *black* berry. *Seeds* 1–5, kidney-shaped.– Fl. 1–5. Fr. 6–7.

Fig. 13.58b: *Myrceugenia exsucca* (DC.) O. Berg: bark

Status and distribution: Native; in Argentina: CHU, NE, RN, in the PN Lago Puelo, Lanín, Nahuel Huapi ; in Chile: from the Prov. of Chopapa to the Prov. of Chiloé (Regions IV-X).

Fig. 13.58c: *Myrceugenia exsucca* (DC.) O. Berg: twig

Habitat: Very hygrophilous species, grows along rivers, lakes, marshes, mainly on temporarily flooded soils.
Elevation: 500–1000 m.
Uses: Protection of river banks. Besides, a species of ornamental value.

Fig. 13.58d: *Myrceugenia exsucca* (DC.) O. Berg: leaves

Remark: Further species belonging to the same genus are *Myrceugenia planipes* (Hook. et Am.) O. Berg, usually a shrub, having grooved petioles; *M. parvifolia* (DC.) Kausel, with leaves 1.5–2 cm long, usually a shrub, and not very common, and *M. schulzei* Johow, a tree, endemic to the Isla Más Afuera of the Archipelago Juan Fernández.
Uses in medicine: See entry on *Luma*. The leaves are employed to treat rheumatic disorders and diseases of the skin. TSAM.

Nicotiana glauca Graham

E: Tobacco tree
Sp: Palán-palán, tabaco moro, tabaco moruno, árbol gandul, gandul
Fam. Solanaceae
††

Evergreen small tree or shrub, 2–4 m tall, richly branched. *Bark* greyish, fissured. *Young twigs* glaucous. *Leaves* alternate, simple, bluish-green, 5–20 cm long and 3–10 cm across, with a 3–5 cm long *stalk*; *blade* ovate, elliptic or lanceolate, somewhat leathery; *margin* entire. *Flowers* in short, terminal panicles: yellow, 2–4 cm long; *calyx* tubular, with 5 triangular lobes; *corolla* a long, narrow tube, with 5 short limbs; *stamens* 5, within the tube of the corolla. *Fruit* an ovoid capsule, 0.7–1.5 cm long. *Seeds* numerous, small.– Fl. 10–3. Fr. 11–4.
Status and distribution: Native in Argentina: BA, CA, CO, COR, DF, ER, FO, JU, LR, ME, SA, SE, SF, SL, TU. In Patagonia (CHU), spreading along the roadsides; besides, it is being cultivated on pavements (sidewalks) (e.g. in Trelew).

Fig. 13.59a: *Nicotiana glauca* Graham: shape [Trelew]

Remark: The whole plant is very poisonous, especially leaves and flowers. The species belonging to the genus *Nicotiana* contain several alkaloids (e.g. (–)-anabasine, nicotine) which are highly toxic.
Uses in medicine: Anabasine has insecticide activity. Extracts of *N. glauca* have bactericide properties. TSAM.

Fig. 13.59b: *Nicotiana glauca* Graham: twig

Nothofagus Blume

Deciduous or evergreen trees. *Buds* fusiform. *Leaves* alternate; *margin* serrate or dentate-crenate or entire. *Male flowers* axillary, solitary or in 2–3-flowered clusters, sessile or shortly pedunculate; *perianth* splitting irregularly, *stamens* 8–40. *Female flowers* usually in groups of 3 in a sessile or shortly pedunculate cupule; *styles* 3. *Fruit* a nut, 3- or 2-angled, generally winged.

The genus *Nothofagus* comprises about 35 species, native to Australasia and temperate South America. All the species are somewhat calcifuge.

Key

Subgroup I:
- *Leaves* evergreen, leathery, less than 4.5 cm long;
- *Buds* enclosing leaves either only folded along the midvein or flattened:
  N. betuloides,
  N. dombeyi,
  N. nitida.

Characters of leaves	*N. betuloides*	*N. dombeyi*	*N. nitida*
arrangement	crowded towards tip of branches	distributed along the branches	distributed along the branches
size	0.5–2.5 x 1 cm	2–3.5 x 1–1.5 cm	2.5–4 x 2–3 cm
shape of blade	ovate-elliptic	ovate-lanceolate to ovate-rhombic	rhombic to ovate-lanceolate, apex acute
underside	with whitish glands	usually glabrous	glabrous
margin	crenulate-serrate; teeth broad	irregularly bi-serrate; teeth fine	serrate; teeth fine
lateral veins	4–6 pairs, somewhat hidden	4–8 pairs, not prominent	4–6 pairs, markedly prominent

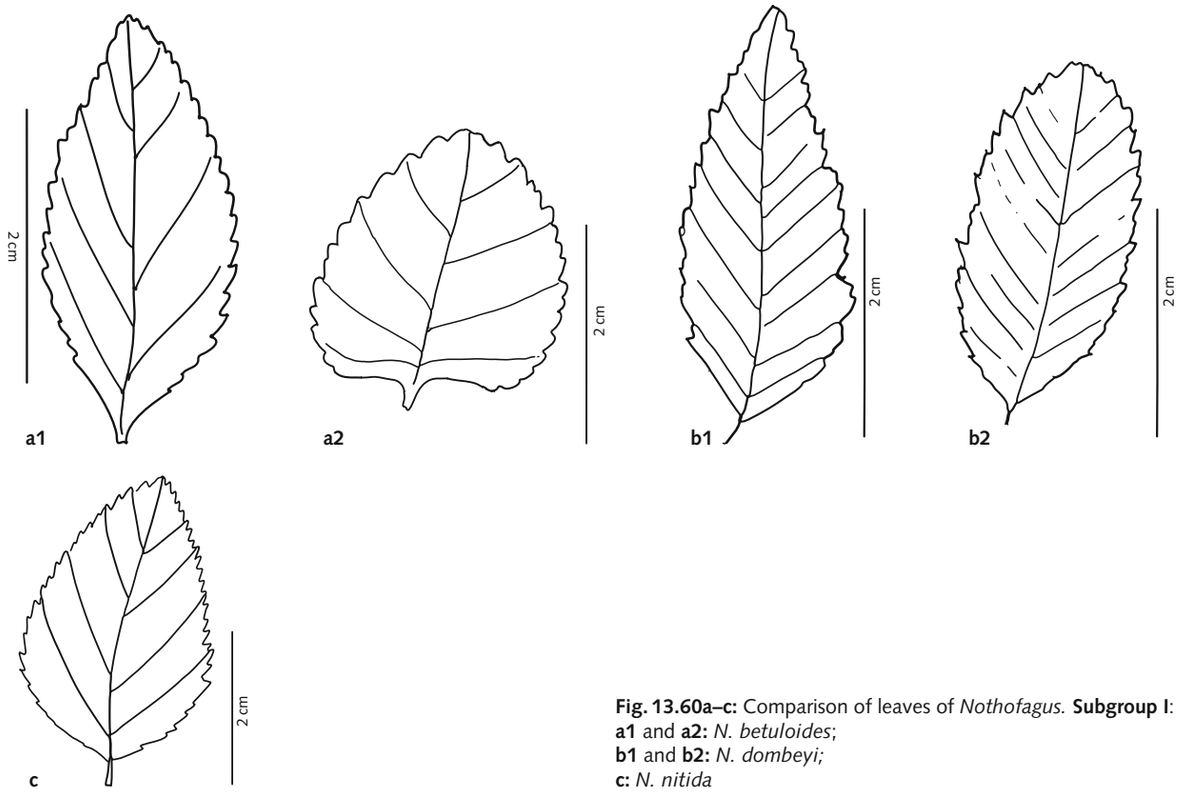


Fig. 13.60a–c: Comparison of leaves of *Nothofagus.* **Subgroup I**:
a1 and **a2:** *N. betuloides*;
b1 and **b2:** *N. dombeyi;*
c: *N. nitida*

Key

Subgroup II: – *Leaves* deciduous; thin or comparatively thick – or sub-coriaceous, and then 7–13 cm long;
– *Buds* enclosing leaves with folded blades:
N. alessandrii,
N. alpina,
N. antarctica,
N. glauca,
N. leonii,
N. obliqua var. *obliqua*,
N. obliqua var. *macrocarpa*,
N. pumilio.

1.	– Base of blade clearly asymmetric (oblique) or sub-cordate and slightly oblique	→ 2.
	– Base of blade usually symmetric	→ 3.
2.	– Blade thick, ovate or triangular, undulate, 1–3.5 cm long, base sub-cordate, margin irregularly dentate; 4–6 pairs of lateral veins	→ *N. antarctica*
	– Blade membranous, ovate-elliptic, slightly undulate, 2–5 cm long, margin irregularly bi-serrate; more than 6 pairs of lateral veins	→ *N. obliqua* var. *obliqua*
3.	– Lateral veins always ending in the teeth	→ 4.
	– Lateral veins usually ending in the bays between the teeth	→ 5.
4.	– Lateral veins ending in spiny teeth; blade sub-coriaceous, 7–13 cm long; margin dentate-spinose	→ *N. alessandrii*
	– Lateral veins ending in pointed teeth; blade undulate, rough, 3–10 cm long; margin serrate	→ *N. leonii*
5.	– Blade 2–4 cm long; margin crenulate-dentate, having always two lobes between two lateral veins (which end in every second bay)	→ *N. pumilio*

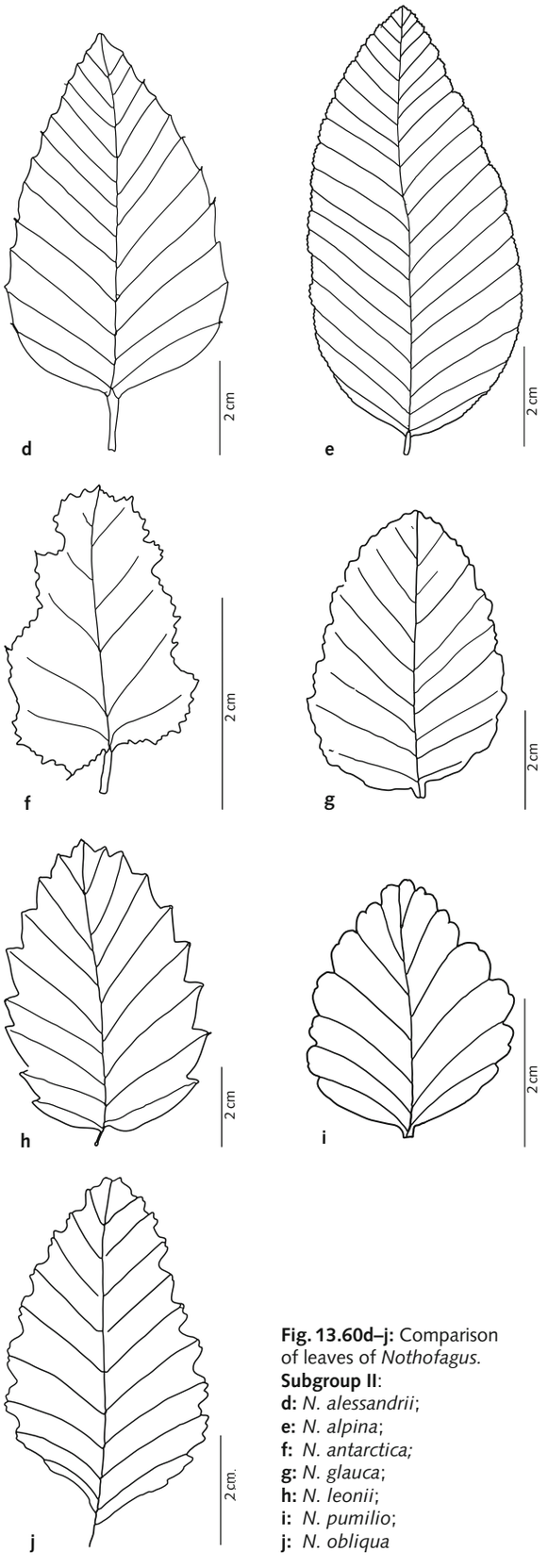


Fig. 13.60d–j: Comparison of leaves of *Nothofagus*.
Subgroup II:
d: *N. alessandrii*;
e: *N. alpina*;
f: *N. antarctica;*
g: *N. glauca*;
h: *N. leonii*;
i: *N. pumilio*;
j: *N. obliqua*

	– Blade longer than 4 cm; margin regularly or irregularly serrate	→ 6.
6.	– Leaves stalked; blade ovate-oblong or ovate-lanceolate, undulate-folded, 4.5–15 cm long; margin regularly serrate, 14–20 pairs of lateral, parallel veins, ending in as many bays	→ *N. alpina*
	– Leaves sub-sessile; blade ovate, sinuose towards the margin, 4–9 cm long; base sub-cordate; margin irregularly serrate; 8–10 pairs of lateral veins	→ *N. glauca*

Remarks on *N. alessandrii, N. glauca, N. leonii, N. macrocarpa, N. nitida,* and *N. rutila,* endemic species of Chile:
N. alessandrii Espinosa (Sp. Ruil) is restricted to the Region VII: Coast Cordillera of the Provinces Talca and Cauquenes, Río Maule basin.
N. glauca (Phil.) Krasser (Syn.: *Fagus glauca* Phil., *Nothofagus megalocarpa* Reiche, *Nothofagus obliqua* (Mirb.) Oerst. var. *glauca* (Phil.) Reiche) (Sp. Roble Maulino, roble, roble colorado, hualo), grows from the Prov. of O'Higgins to the Prov. of Ñuble (Regions VI–VIII).
N. leonii Espinosa (Sp. Hualo, huala), grows on the Cordillera de los Andes in the Prov. Linares and along the coast from Curicó to Cauquenes (Region VII).
N. nitida (Phil.) Krasser (Syn.: *Fagus nitida* Phil.) grows from the Prov. of Valdivia (Region X) down to the Prov. of Capitán Prat (Region XI), mainly on the Cordillera de la Costa.
N. macrocarpa (DC.) Vazq. et Rodr. and *N. rutila* Rav. are endemic species of Chile, of the Cantillana massif (province Melipilla) and of the north and northwest of Santiago, respectively (see Ravenna (2002)).

Fig. 13.61b: *Nothofagus alpina* (Poepp. & Endl.) Oersted: bark

Nothofagus alpina (Poepp. & Endl.) Oersted
Syn.: *Fagus alpina* Poepp. & Endl., *Fagus nervosa* Phil., *Fagus procera* Poepp. & Endl., *Nothofagus nervosa* (Phil.) Dimitri & Milano, *Nothofagus procera* (Poepp. & Endl.) Oerst.
E: Rauli
Sp: Raulí, rewulí, roblín, ruilí, ruil, cedro del sur
Fam. Fagaceae

Fig. 13.61a: *Nothofagus alpina* (Poepp. & Endl.) Oersted: shape [Frutillar]

Deciduous, monoecious tree, up to 40 m tall; *crown* oblong-pyramidal. *Trunk* upright, cylindrical. *Bark* dark grey, longitudinally fissured. *Leaves* alternate, simple, stalked, 4.5–12 cm long and 2.5–5 across; *blade* from ovate-oblong to ovate-lanceolate, undulated or folded, light green; *margin* weakly serrate; *secondary veins* parallel to each other, prominent on the *underside*. *Male flowers* in groups of 2 or 3, sometimes solitary; *stamens* numerous; *female flowers* in groups of 3, with a cupule in common. *Fruit*: a cupule with 3 nuts, the central one two-winged, the lateral two with one wing each.– Fl. 10–12. Fr. 3–4.

Status and distribution: Native; in Argentina: NE, in the PN Lanín; in Chile: from the Prov. of Curicú to the Prov. of Valdivia (Regions III-X).

Habitat: Zones of low temperature and well drained; it grows together with *Nothofagus dombeyi, N. obliqua*, and, above all in Chile, with *Podocarpus salignus, Eucryphia cordifolia*, among other species.

Elevation: 100–500 m.

Hardiness: –16° C.

Uses: Wood appreciated, resistant, rich in tannins, used for furniture, carpentry, boxes, and construction.

Fig. 13.61c: *Nothofagus alpina* (Poepp. & Endl.) Oersted: branch

Fig. 13.61d: *Nothofagus alpina* (Poepp. & Endl.) Oersted: leaves

Nothofagus antarctica (G. Foerster) Oersted

Syn.: *Fagus antarctica* G. Foerst.
E: Antarctic beech
Sp: Ñire, ñirre, anís, roble, roble ñire, hualo, guindo
Fam. Fagaceae

Fig. 13.62a: *Nothofagus antarctica* (G. Foerster) Oersted: forest in an area of transition [Cancha Carrera, Prov. Santa Cruz]

Deciduous, monoecious tree or shrub, up to 15 (20) m tall, growing as tree in Tierra del Fuego but often as stunted shrub towards the northern regions, and in the zones of transition. *Trunk* frequently twisted and

Fig. 13.62b,c: *Nothofagus antarctica* (G. Foerster) Oersted: **b:** shape [Trevelín]; **c:** bark

gnarled. *Bark* dark grey, strongly and irregularly fissured. *Leaves* alternate, simple, petiolate, 1–3.5 cm long and 2 across; *blade* ovate; *base* slightly cordate and oblique; *apex* obtuse; *margin* lobed, undulate, irregularly toothed. *Foliage* deciduous, turning red in autumn. *Male flowers* axillary, solitary, with 10 stamens; *female flowers* in groups of 3, surrounded by a cupule. *Fruits:* 3 nutlets, the central one flattened, two-winged, the lateral two triangular, with three wings. Fl. 11–1. Fr. 12–2.

Fig. 13.62d: *Nothofagus antarctica* (G. Foerster) Oersted: twig

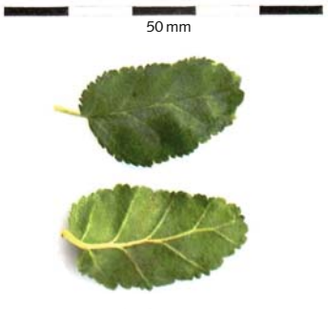


Fig. 13.62e: *Nothofagus antarctica* (G. Foerster) Oersted: leaves, upper side above

Status and distribution: Native; in Argentina: CHU, NE, RN, SC, TF; in Chile: from the river Maule to Cape Horn (Regions VII-XII).

Habitat: Areas of low temperature, poor soils, steep slopes. It can be found in marshes of higher altitude, and in the areas of transition between forest and steppe. It grows together with N*othofagus pumilio* and – in areas with well drained soils – with *N. betuloides*.

Elevation: 0–1500 m.

Uses:

a. Wood: Very knotty, exploited as firewood, and used for rural constructions, e.g. fences.

b. In popular medicine: Against fever. TSAM.

Nothofagus betuloides (Mirbel) Oersted

Syn.: *Fagus betuloides* Mirb.

E: ?

Sp: Guindo, coigüe de Magallanes, coihüe blanco, coihüe magallánico, coihüe del sur, coihue de Tierra del Fuego, coibo, upaya, cuchpaya, ouschpayé, ouchpaya, roble de Magallanes

Fam. Fagaceae

Fig. 13.63a: *Nothofagus betuloides*-forest; on the upper slopes, *N. pumilio* [Seno Última Esperanza (Chile)]

Evergreen, monoecious tree, up to 25 (-35) m tall; *crown* narrow or rounded; it grows as stunted shrub in the most exposed zones. *Trunk* erect. *Bark* dark grey, longitudinally fissured. *Leaves* alternate, simple, briefly stalked, 0–5–2.5 cm long and 1 cm across; *blade* leathery, ovate or rhombic-ovate, the *underside* with whitish glands; *margin* finely serrate. *Male flowers* pedunculate, solitary, with 10 stamens; *female flowers* also pedunculate and solitary. *Fruits:* 3 nutlets in a short cupule. Fl. 11–12. Fr. 1–2.

Status and distribution: Native; in Argentina: SC, in the PN Los Glaciares, and in TF; in Chile: from the Prov. of Valdivia to Cape Horn (Regions X-XII).

Habitat: Mainly in subantarctic regions; in the northern parts of its distribution, it associates with *Pilgerodendron uviferum, Podocarpus nubigenus, Nothofagus dombeyi,*

Fig. 13.63b: forest of *N. betuloides* [Puerto Toro (Chile)]

N. pumilio, among other species. *N. betuloides* and *N. pumilio* are the dominant species of the subantarctic, rainy forests. *N. betuloides* prefers deeper temperatures than *N. dombeyi*.

Elevation: 0–1000 m.

Hardiness: –16° C.

Uses: Moisture-resistant wood, used for furniture, in construction, and barrel-making.

Fig. 13.63c,d: *Nothofagus betuloides* (Mirbel) Oersted: **c**: shape [Lago Argentino]; **d**: bark

Fig. 13.63e: *Nothofagus betuloides* (Mirbel) Oersted: twig

Fig. 13.63f: *Nothofagus betuloides* (Mirbel) Oersted: twig with fruits

Fig. 13.64c,d: *Nothofagus dombeyi* (Mirbel) Oersted: **c**: bark of young tree; **d**: bark of old tree

Nothofagus dombeyi (Mirbel) Oersted

Syn.: *Fagus dombeyi* Mirb., *Nothofagus dombeyi* (Mirb.) Blume
E: Evergreen southern beech
Sp: Coihue, coigüe, coíhue, coygüe, coíhue de Tierra del Fuego, coíhue del sur
Fam. Fagaceae

Fig. 13.64a,b: *Nothofagus dombeyi* (Mirbel) Oersted: **a**: shape in area of transition [PN Los Alerces]; **b**: shape of young tree in humid area [PN Lanín]

Evergreen, monoecious tree, up to 45 m tall; *crown* made up of stratified, open branches, ending comb-like. *Trunk* cylindrical, upright, not branched in the lower parts. *Bark* dark grey, smooth, becoming longitudinally, yet superficially fissured with age. *Leaves* alternate, briefly stalked, 2–3.5 cm long and 1–1.5 across; *blade* lanceolate, slightly rhomboidal, leathery, dark- or yellowish-green; *apex* acute; *margin* finely serrate. *Male flowers* in groups of 3, with a rudimentary perigon and 10 stamens; *female flowers* in groups of 3, the lower parts surrounded by a cupule. *Fruits:* 3 nutlets, the central one two-winged, the lateral two with three wings.

Status and distribution: Native; in Argentina: CHU, NE, RN; in Chile: from the Prov. of Colchagua to the Prov. of Aisén (Regions VI-XI).

Habitat: Although showing a high range of tolerance, it prefers moist soils, thriving best along river banks and shores of lakes, frequently with *Chusquea* sp. in the undergrowth. In the northern areas of its distribution in Chile, it associates e.g. with *Nothofagus alpina, N. obliqua, Aextoxicon punctatum, Laurelia sempervirens, Podocarpus salignus*.

Elevation: 0–1000 m.

Uses:

a. Wood: Hard, of great mechanical endurance, used for furniture, floors, sleepers, barrel-making, etc.

b. In popular medicine: Against fever. TSAM.

Fig. 13.64e: *Nothofagus dombeyi* (Mirbel) Oersted: twig, under side

Fig. 13.64f: *Nothofagus dombeyi* (Mirbel) Oersted: twig, upper side

Fig. 13.64g: *Nothofagus dombeyi* (Mirbel) Oersted: twig with gallnut

Fig. 13.64h: *N. nitida* (Phil.) Krasser: twig, upper side

Fig. 13.64i: *N. nitida* (Phil.) Krasser: shape [PN El Alerce Andino]

Nothofagus obliqua (Mirbel) Oersted
Syn.: *Fagus obliqua* Mirb., *Nothofagus obliqua* (Mirbel) Blume
E: Roble beech
Sp: Roble pellín, roble pillín, hualle, coyam, coyán, coyán quimamell, roble de Neuquén, roble, pellín
Fam. Fagaceae

Fig. 13.65a1,a2: *Nothofagus obliqua* (Mirbel) Oersted: shape [**a1:** San Martín de los Andes; **a2:** Valdivia]

Deciduous, monoecious tree, up to 40 m tall; *crown* pyramidal. *Trunk* cylindrical, upright. *Bark* smooth, with lentices when young, dark grey with age, deeply fissured, with rounded plates peeling off. *Leaves* alternate, simple, shortly stalked, 2–5 (7) cm long and 2 across; *blade* usually ovate-lanceolate, often folded, with an oblique (asymmetric) *base*; *margin* undulate, feebly lobed, irregularly biserrate. *Foliage* of a pale green turning brown-red in autumn. *Male flowers* axillary, solitary, with an irregularly lobed perianth, and 30–40 stamens; *female flowers* in groups of 3, surrounded by a cupule. *Fruits:* 3 nutlets, the central one two-winged, the lateral two with three wings.– Fl. 9–11. Fr. 12–1.

Status and distribution: Native; in Argentina: NE, mainly in the PN Lanín, and TF; in Chile: from the Prov. of Colchagua to the Prov. of Llanquihue (Regions VI-X).

Habitat: In lower areas, preferring fertile and moist soils with more than 500 mm of annual rainfall. In colder areas, it is replaced by *N. dombeyi*.

Elevation: 0–700 m.

Hardiness: –16° C.

Uses:

a. Wood: Rich in tannin, hard and resistant: used for furniture, carpentry, constructions, sleepers, musical instruments, poles, shipbuilding, etc.

b. In popular medicine: Against fever. TSAM.

Fig. 13.65b,c: *Nothofagus obliqua* (Mirbel) Oersted: **b:** young bark with lenticels; **c:** old bark

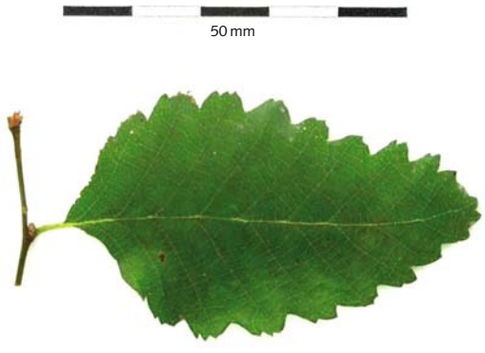


Fig. 13.65d: *Nothofagus obliqua* (Mirbel) Oersted: leaf, upper side

Fig. 13.65e: *Nothofagus obliqua* (Mirbel) Oersted: leaf, underside

Nothofagus pumilio (Poeppig et Endl.) Krasser
Syn.: *Fagus pumilio* Poepp. & Endl
E: Lenga
Sp: Lenga, roble, roble blanco, roble lenga, roble de Tierra del Fuego, roble de Magallanes, leñar
Fam. Fagaceae

Fig. 13.66a: *Nothofagus pumilio* (Poeppig et Endl.) Krasser: forest on the South-exposed slope of Lago Argentino: left, mature; right, young

Deciduous, monoecious tree, up to 30 m tall; *crown* broadly columnar in the lower regions; *shape* stunted and shrubby in the upper regions and in wind-exposed zones. *Stem* upright, cylindrical. *Bark* grey and smooth with horizontal lenticels in young specimens, becoming brownish-grey and longitudinally chapped in old trees. *Leaves* alternate, simple, stalked, 2–4 cm long and 1,4–3 across; *blade* ovate-elliptic, base slightly cordate, hairy on veins; margin crenate-dentate, having two lobes between two veins. *Foliage* dark green, turning red in autumn. *Male flowers* solitary, with hairy peduncles to 4 mm long; *perigon* bell-shaped, 5–7 lobed; *stamens* numerous; *female flowers* sessile, with small scales at the base. *Fruit* a three-winged nutlet.– Fl. 10–11. Fr. 3–4.

Status and distribution: Native; in Argentina (CHU, NE, RN, SC, TF); in Chile: from the Prov. of Talca to Tierra del Fuego (Regions VII-XII).

Fig. 13.66b: *Nothofagus pumilio* (Poeppig et Endl.) Krasser: forest in zone of transition, growing only in humid funnels [Leleque]

Fig. 13.66c: *Nothofagus pumilio* (Poeppig et Endl.) Krasser: shape of solitary tree [Esquel]

Habitat: In the northern regions, it forms the upper limit of the arboreal vegetation; in the southern regions, it grows in the lowlands, even at sea level; adapted to low temperatures and high levels of humidity.

Elevation: 0–1500 m.

Uses:

a. Wood: For carpentry in general, cooperage, boat-building, aircraft, etc.

b. In popular medicine: Against fever. TSAM.

Distinctive characters: Leaves with 5–7 pairs of secondary, sub-parallel veins which end in clefts, leaving two small lobes ("teeth") and one cleft between two veins.

Fig. 13.66d,e: *Nothofagus pumilio* (Poeppig et Endl.) Krasser: **d:** shape in the forest [Esquel]; **e:** shape in Tierra del Fuego [Cerro Martia])

Fig. 13.66f,g: *Nothofagus pumilio* (Poeppig et Endl.) Krasser: **f:** young bark with lenticels; **g:** bark of mature tree

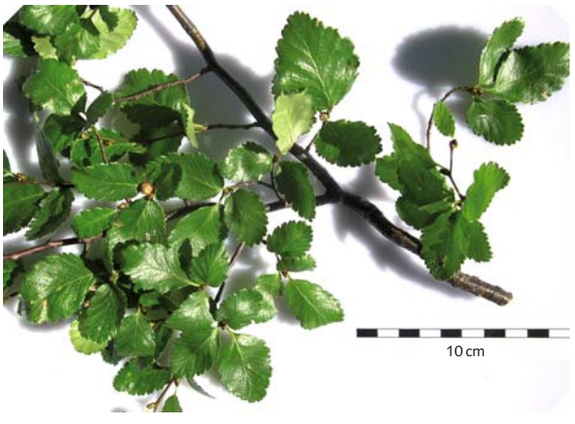


Fig. 13.66h: *Nothofagus pumilio* (Poeppig et Endl.) Krasser: twig

Fig. 13.66i: *Nothofagus pumilio* (Poeppig et Endl.) Krasser: twig in autumn

Olea europaea L.

E: Olive tree
Sp: Olivo, acebuche, zambujo, olivero, aceitunero
Fam. Oleaceae

Fig. 13.67a: *Olea europaea* L.: shape [Los Antiguos]

Evergreen tree, 2.5–8 m tall; *crown* broad, irregular, rounded. *Stem* often forked and gnarled with age. *Bark* fissured, grey or silvery. *Branches* long, elastic, frequently thorny at their ends. *Leaves* opposite, simple, leathery, 2.5–8 cm long, shortly stalked; *blade* oblong-lanceolate, *upper side* dark grey-green, *underside* silvery; *margin* entire, revolute. *Flowers* in axillary, 2–5 cm long racemes, whitish, fragrant; *calyx* small, lobed; *corolla* tubular, with 4 lobes; *stamens* 2; *ovary* superior, bilocular. *Fruit* a green, glossy drupe, turning violet and black with maturity, varying in form and size, depending on the variety, up to 3.5 cm long.– Fl. 10, 11. Fr. 4.

Status and distribution: Introduced; probably native to the eastern Mediterranean. In Patagonia, ornamental, down to latitude 46° 33' (Los Antiguos).

Hardiness: –4° C.

Uses:

a. Wood: For domestic utensils and decorative work.

b. In medicine: The leaves contain cinchonidine, a quinoline alkaloid with antimalarial properties. The leaves, the bark and the fruit also carry oleuropein, an iridoid with hypotensive, coronary dilating, anti-arrhythmic and spasmolytic activities. The oil has antihypertensive, diuretic, and laxative effects. TEM, TAM.

Fig. 13.67b: *Olea europaea* L.: twig with fruits

Fig. 13.67c: *Olea europaea* L.: leaves and fruit

Fig. 13.68a: *Parrotia persica* (DC.) C.A. Meyer: twig

Fig. 13.68b: *Parrotia persica* (DC.) C.A. Meyer: bark

Parrotia persica (DC.) C.A. Meyer

E: Persian Ironwood
Sp: Árbol de hierro, parrotia
Fam. Hamamelidaceae

Deciduous tree or shrub, up to 5 (rarely 20) m tall; *crown* broadly conical. *Bark* pink-grey or grey-brown, scaling. *Leaves* alternate, shortly stalked; *blades* obovate, 6–12 cm long and 3–6 across, *upper side* shiny green, *underside* thinly pubescent; *base* rounded or subcordate; *margin* wavy crenate-serrate on the upper half. The *foliage* becomes brilliant yellow and crimson in autumn. *Flowers* in dense clusters, precocious, without *petals*; stamens with red *anthers*. *Fruit* a capsule, about 1 cm long.– Fl. 9.

Status and distribution: Introduced; native round the southern end of the Caspian Sea, in the Caucasus, and in northern Iran. Ornamental species.

Hardiness: –20° C.

Uses: Wood for cabinet making and decorative work.

Fig. 13.68c: *Parrotia persica* (DC.) C.A. Meyer: leaves

Fig. 13.68d: *Parrotia persica* (DC.) C.A. Meyer: fruit

Fig. 13.69b: *Persea lingue* Nees: leaves

Persea lingue Nees
Syn.: *Laurus linguy* Miers ex Bertero
E: Lingue
Sp: Lingue, liñe, litchi, canela rosa
Fam. Lauraceae

Fig. 13.69a: *Persea lingue* Nees: twig

Fig. 13.69c: *Persea lingue* Nees: bark

Evergreen tree, up to 30 m tall; *crown* spherical, densely foliated. *Bark* light-grey, thick, wrinkled, with rounded swellings. *Young branches* and *buds* reddish-tomentose. *Leaves* alternate, simple, 6–12 cm long and 3–5 across, shortly stalked; *blades* elliptic, leathery, glabrous and smooth on the *upper side*, pubescent on the *underside*, with a marked midvein and 4–8 pairs of lateral veins; *margin* entire, slightly revolute. *Flowers* in panicles: small, hairy, yellow; *tepals* 6, the 3 exterior shorter; *androecium* of 12 stamens, some of them sterile; *gynoecium* unicarpelar, with one ovule. *Fruit* an elongate berry, 1–2 cm long, black-blue, containing one seed.– Fl. 9–1. Fr. 1–4.

Status and distribution: Native; in Argentina: CHU, in the northern arm of the PN Lago Puelo; in Chile: from the Prov. of Quillota to the Prov. of Chiloé (Regions V-X).

Habitat: It prefers rather deep soils; in the northern area, it grows with *Cryptocarya alba, Peumus boldo*; more to the south, it associates with *Drimys winteri, Laureliopsis philippiana, Lomatia ferruginea, L. hirsuta, Weinmannia trichosperma*.

Uses: Dark wood, with a reddish gloss: for furniture, parquet, windows, steps of ladders, etc. Bark rich in tannins, used for tannery.

Remarks: The leaves are toxic for sheep and horses. *P. lingue* has been over-exploited in Chile.

Peumus boldus Mol.
Syn.: *Ruizia fragrans* R. et P., *Peumus fragrans* Pers., *Boldus chilensis* Mol.
E: Boldo
Sp: Boldo, boldu
Fam. Monimiaceae
†

Evergreen, dioecious tree or shrub, up to 20 m tall; *crown* spherical, densely foliated. *Bark* dark-grey, thin, rugose. *Young branches* darkly tomentose. *Leaves* opposite, simple, 3–7 cm long and 1–5 across, shortly stalked; *blade* ovate-elliptic, leathery, aromatic, with hairs in fascicles, densely glanduliferous, the *upper side* dark green, the *underside* light green; *margin* entire, revolute. *Flowers* in axillary racemes of 5–12 units: *male flowers* yellowish-white, with a perianth of 10–12 segments in 2–3 whorls, the external membranous, pubescent, the internal petalode, *stamens* numerous; the *female flowers* with a perianth similar to the male one; *gynoecium* formed by 3–5 unilocular, uniovulate carpels, surrounded by the perianth. *Fruit* a drupe, usually 2–5 together.– Fl. 6–8. Fr. 12–2.

Status and distribution: Native to Chile: from the Prov. of Limarí to the Prov. of Osorno (Regions IV-X). Habitat: Species adapted to stony soils of scant humidity. In humid gorges, it grows e.g. with *Gevuina avellana*, *Luma apiculata*.

Elevation: 5–1000 m.

Uses:

a. Fruits: The fruits are edible.

b. In medicine: The leaves contain boldine, an isoquinoline alkaloid with choleretic and laxative properties, used in cases of hepatic dysfunction and cholelithiasis. The leaves are used as a herbal, digestive tea. TSAM; TEM.

Remark: Roth et al. (1994) consider the leaves to be poisonous.

Fig. 13.70: *Peumus boldus* Mol.: branch, with flowers and fruits: **1., 2.** front and back view of male flower; **3., 4.** stamen; **5.** portion of inflorescence; **6.** female flower; **7.** carpels; **8.** fruits. – J.D. Hooker, *Curtis's Botanical Magazine*, vol. XLIVof the third series (or vol. CXIV of the whole Work), London, 1888 (Bibliothek der Botanischen Institute der Universität Zürich)

Phellodendron amurense Ruprecht
E: Amur cork tree
Sp: Felodendro del Amur, alcornoque del Amur
Fam. Rutaceae

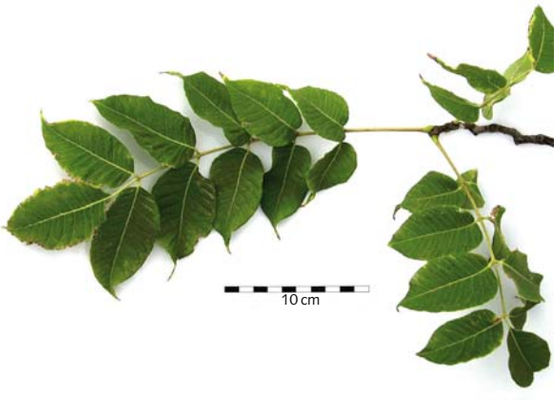


Fig. 13.71a: *Phellodendron amurense* Ruprecht: twig

Deciduous, dioecious tree, up to 15 m tall; *crown* broadly spreading. *Bark* grey-brown, corky, deeply fissured. *Leaves* opposite, odd-pinnate, stalked; *leaflets* 5–13, ovate or ovate-lanceolate, shortly stalked, 5–10 cm long, *margin* entire or minutely toothed, *upper side* glossy dark green, *underside* blue-green, with hairs at the base of the midrib. *Flowers* in upright panicles: greenish-yellow, to 6 mm across. *Fruit* a black drupe, 1 cm across.– Fl. 12. Fr. 1–3.

Status and distribution: Introduced; native to China and Japan. In Patagonia, rarely planted, ornamental.
Hardiness: –32° C.
Uses:
a. Bark: Used as cork.
b. In medicine: The bark contains berberine (and other isoquinoline alcaloids) and sesquiterpenes; it has antimicrobial properties. It is used against inflammations of the urinary tract, meningitis and conjunctivitis. TCM.

Fig. 13.71b: *Phellodendron amurense* Ruprecht: **1.** twig bearing fruits, besides flowers and leaflet: **2.** leaflet, underside **3.** margin of a leaflet, with glands in the notches; **4.** part of a male inflorescence; **5.** male flower; **6.** part of a female inflorescence; **7.** female flower; **8.** fruit; **9.** seed [O. Stapf, *Curtis's Botanical Magazine*, vol. CXLVIII, London, 1922 (Bibliothek der Botanischen Institute der Universität Zürich)]

Photinia serratifolia (Desf.) Kalkman
Syn.: *Photinia serrulata* Lindl
E: Photinia
Sp: Fotinia, acerolo chino
Fam. Rosaceae

Fig. 13.72a: *Photinia serratifolia* (Desf.) Kalkman: inflorescence

Evergreen tree or shrub, up to 12 m tall. *Bark* greyish, smooth. *Twigs and young leaves* red. Leaves alternate, simple, leathery, 10–20 cm long and 3,5–7,5 across, petiole 2–3 cm; *blade* oblong, *base* cuneate or rounded, *apex* pointed, *upper side* of adult leaf glossy dark green, *underside* yellowish green; *margin* finely serrate. *Flowers* in corymbose panicles of 10–15 cm across: white, 1 cm across; *sepals* 5, on the rim of the receptacle; *petals* 5; *stamens* about 20; *ovary* inferior, *styles* 2 (-3–5). *Fruit* drupe-like, ovoid, red, to 6 mm across, crowned by the teeth of the calyx.– Fl. 11–12. Fr. 4–6.
Status and distribution: Introduced; native to China and Japan.
Habitat: It prefers sandy or clayey soils. Cultivated because of the fine contrasts between leaves, flowers, and fruits. In Patagonia, rather seldom, in gardens and on pavements.

Fig. 13.72b: *Photinia serratifolia* (Desf.) Kalkman: twig with young leaves

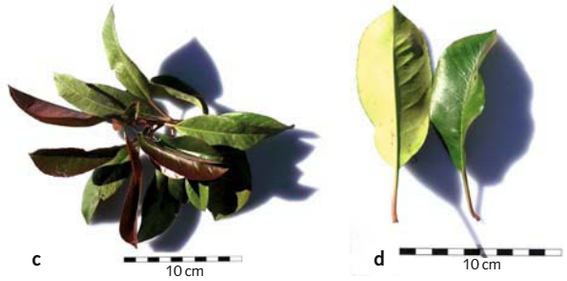


Fig. 13.72c,d: *Photinia serratifolia* (Desf.) Kalkman: **c:** twig; **d:** leaves

Platanus x hispanica Mill. ex Muenchh.
Syn.: *Platanus orientalis* L. var. *acerifolia* Aiton, *Platanus acerifolia* (Aiton) Willd., *Platanus x acerifolia* (Aiton) Willd., *Platanus cuneata* Willd
E: London plane, sycamore, plane
Sp: Plátano, plátano de sombra, plátano de paseo, sicomoro
Fam. Platanaceae

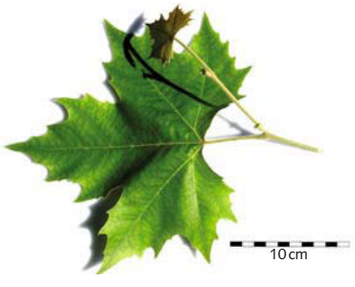


Fig. 13.73a: *Platanus x hispanica* Mill. ex Muenchh.: twig with young leaves

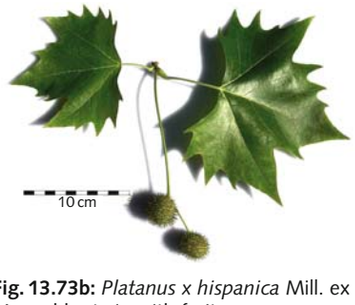


Fig. 13.73b: *Platanus x hispanica* Mill. ex Muenchh.: twig with fruits

Deciduous, monoecious tree, up to 35 m tall, developing a broad, rounded crown. *Branches* twisted. *Bark* creamy, greenish, yellowish, flaking in large patches. *Buds* ovoid-conical, enveloped by the petiole, densely pubescent. *Leaves* alternate, palmatifid, large, petiole 5–7.5 cm long; *blade* between leathery and membranous, 15–20 cm long and (12-) 20–25 across, usually with 3–5 (7) not very deeply incised lobes, the terminal one larger, acuminate, *upper side* of blade glossy bright green, *underside* paler, yellowish; base truncate or broadly cordate. *Young leaves* pubescent, gradually losing their hairiness. *Flowers* commonly in pairs of globose, pendulous, unisexual capitula with peduncles of about 3 cm length: *Male* capitula smooth, 1 cm across, with very small flowers; *sepals* 3–8; *petals* 3–8; *stamens* 3–8. *Female* capitula covered with bristles, 1.5 cm across, flowers with 3–8 free, hairy *carpels*. *Fruits* achenes, bearing a pappus.– Fl. 11. Fr. 3–9.

Status and distribution: Introduced. The origin is still matter of controversy; perhaps a cross between P. *orientalis* L. (Oriental plane) and *P. occidentalis* L. (American sycamore) or a variety of *P. orientalis*. To this latter hypothesis refers the synonym *P. orientalis* L. var. *acerifolia* Aiton. A very popular shade-giving species in urban areas. It requires fresh, fertile soils and considerable space to develop properly.

Hardiness: –20° C.

Uses:

a. Wood: For furniture and decorative work; also used as fuel.

b. In medicine: The species of the genus *Platanus* contain fustin, a flavonoid with antibacterial properties.

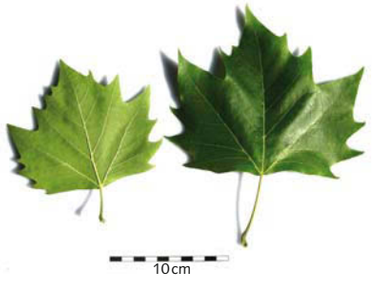


Fig. 13.73c: *Platanus x hispanica* Mill. ex Muenchh.: leaves

Fig. 13.73d: *Platanus x hispanica* Mill. ex Muenchh.: bark

Populus Tourn. ex L.
Fam. Salicaceae

Fig. 13.74a: *Populus nigra* var. *pyramidalis* Spach: shape [Esquel]

Deciduous, monoecious trees, up to 35 m tall. *Axillary buds* protected by *several* overlapping scales; *terminal bud* present, rarely lacking. *Leaves* alternate, simple, with long *petioles*; *blade* ovate or triangular, with a lobed or serrate *margin*. *Male catkins* pendulous, scales laciniate. *Male flowers* with 4–20 stamens. *Female flowers* having a unilocular, pluriovulate ovary. *Fruit* a capsule, releasing numerous woolly seeds.– Fl. 9–10. Fr. 11–12.

Genus of about 30 species, native to the northern hemisphere.

Remarks: Natural and manmade crosses have led to an enormous amount of poplar hybrids, varieties, and cultivars, the most extended being *P. nigra* var. *pyramidalis* Spach, known as "Lombardy poplar" – a male trunk, multiplied through cuttings. In Patagonia, other cultivars and hybrids are also cultivated, e.g. *P. x euramericana* (Dode) Guinier, its parents being *P. deltoides* Marshall and *P. nigra* L.

Plants belonging to the genus *Salix* can be distinguished from those of *Populus* by the following traits: a*xillary buds* protected by *one* scale; *terminal bud* lacking; *leaves* shortly stalked, *catkins* erect, scales entire.

Uses:

a. Wood: Mainly for industrial use, constructions, packaging, paper pulp.

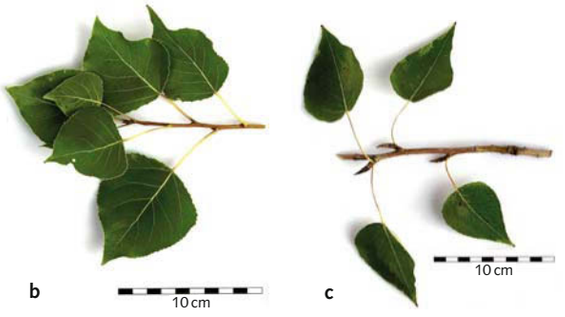


Fig. 13.74b,c: Branches of **b:** *Populus nigra* var. *pyramidalis* Spach; **c:** *Populus trichocarpa* Torrey & A. Gray ex Hooker

b. In medicine: Populus spp. contain various phenols and phenolic acids (e.g. catechol, salicin); salicin is used as an analgesic, anti-rheumatic. TEM, TNAM.

Fig. 13.74d: *Populus alba* L: branch

Remark: P. alba is highly competitive in various habitats and can become a noxious weed (see GISD).

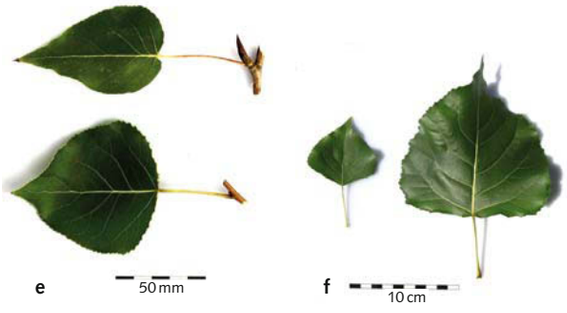


Fig. 13.74e,f: *Populus* Tourn. ex L. – Comparison of leaves: **e:** *P. trichocarp*a (above) vs. *P. nigra;* **f:** *P. nigra* (left) vs. *P. x euramericana* (Dode) Guinier

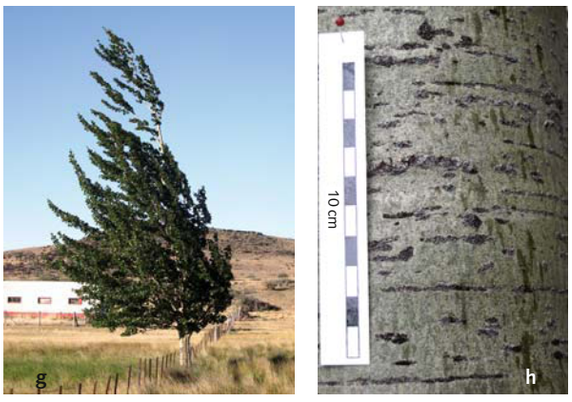


Fig. 13.74g,h: *Populus tremula* L.: **g:** shape [Güer Aike, Santa Cruz]; **h:** bark

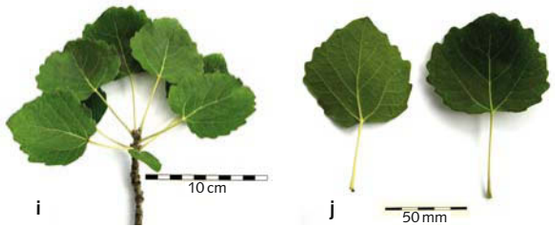


Fig. 13.74i,j: *Populus tremula* L.: **i:** twig; **j:** leaves

Populus alba L.
Syn.: *Populus bolleana* Lauche, *Populus nivea* A. Wesmael
E: White poplar, abele
Sp: Álamo plateado, álamo blanco, chopo blanco, peralejo, álamo cano, chopo cano, álamo gris, álamo, chopo

Populus nigra L.
Syn.: *Populus thevestina* Dode
E: black poplar
Sp: Chopo, álamo negro, álamo, chopo mosquitero, negrillo

Populus tremula L.
E: Aspen
Sp: Álamo temblón, chopo temblón.

Populus trichocarpa Torrey & A. Gray ex Hooker.
E: Western balsam poplar, black cottonwood
Sp: Chopo de Virginia

Characters	*Populus alba*	*Populus nigra*	*Populus tremula*	*Populus trichocarpa*
Bark	whitish or grey	whitish when young, becoming fissured, with blackish ridges	greenish-grey when young, becoming fissured, with black ribs with age	dark grey and deeply fissured
Axillary buds	tomentose, white	viscid, sticky	brownish, slightly tomentose	very viscid, large, corneous, aromatic, scented
Leaf-blades	variable: 6–12 cm long on vigorous twigs, 4–9 on feebler shoots; *blade* palmatifid, *upper side* dark green, *underside* white-tomentose	5–10 cm long and 4–8 across; *blade* rhombic-ovate, green on both sides; *apex* taper-pointed; *margin* translucent, serrate, teeth hardly prominent, glandulous	9–12 cm long on vigorous twigs, 4–6 on feebler shoots; *blade* orbicular, sometimes triangular, with a truncate or cordate base; *upper side* glossy green, *underside* opaque; *margin* with irregular blunt teeth	7.5–12 cm long and 5–6 across; *blade* broadly ovate, *upper side* dark green, *underside* whitish or rusty and reticulate; *base* truncate or slightly cordate; *apex* taper-pointed; *margin* feebly serrate
Remarks	very polymorphous	var. pyramidalis with ascendent lateral branches, sticking to the trunk	fluttering leaves, which turn into a brilliant yellow and, sometimes, red in autumn	
Origin	Europe, central Asia	Europe, Asia, North Africa	Europe, Asia Minor, North Africa	western North America
Hardiness	–32° C	–20° C; var. *pyramidalis* –24° C	–30° C	–24° C

Prunus L.

Fam. Rosaceae

Deciduous trees or shrubs, sometimes spiny. *Leaves* alternate, simple, usually crenate or serrate, petiolate; *stipules* more or less scarious, often early-falling. *Leaf-blade* at base or *petiole* near base usually with more or less conspicuous glands. *Flowers* solitary or fasciculate corymbose or in short racemes: white or pink, sometimes precocious; *hypanthium* a cup-like or tubular, open *receptacle*, bearing 5 *sepals*, 5 *petals*, 20–15 *stamens*; *carpel* 1, at the base of the receptacle, *style* terminal. *Fruit* a fleshy drupe, with a 1-seeded, indehiscent, hard stone. A genus of over 100 species, native to the temperate zones of the northern hemisphere. In Patagonia, mainly 7 species are cultivated: *P. armeniaca, P. dulcis, P. persica* only in the warmer areas and in walled gardens; *P. avium* and, to a lesser extent, *P. domestica* are intensively cultivated in the microclimatic favourable areas, e.g. in El Bolsón and Los Antiguos; *P. cerasifera* var. *pissardii* and *P. laurocerasus* are very popular ornamental species.

Remark: The seeds of *Prunus* sp. contain toxic cyanogenic glucosides. A particularly high concentration is found in *P. dulcis* var. *amara*.

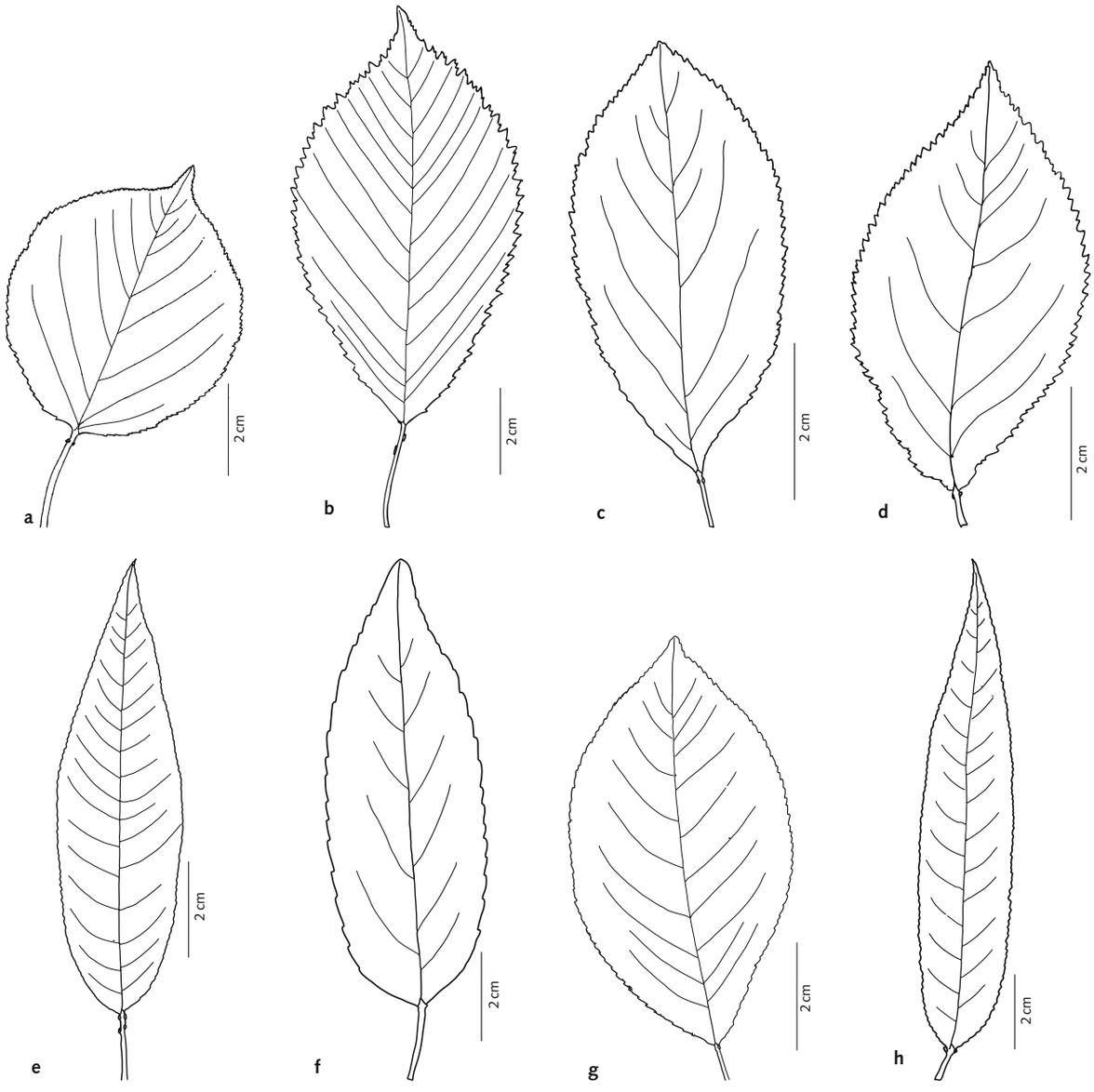


Fig. 13.75a–h: *Prunus* L. – Comparison of leaves: **a:** *P. armeniaca;* **b:** *P. avium;* **c:** *P. cerasifera*; **d:** *P. domestica;* **e:** *P. dulcis;* **f:** *P. lusitanica* **g:** *P. padus;* **h:** *P. persica*;

Key for the identification of 8 species of Prunus

1. –	Leaves evergreen, leathery	→ *P. laurocerasus*
–	Leaves deciduous, not coriaceous	→ 2.
2. –	Leaves almost black to deep purplish	→ *P. ceracifera* var. *pissardii*
–	Leaves green	→ 3.
3. –	Leaves at least twice as long as wide	→ 4.
–	Leaves broadly ovate to suborbicular or obovate to elliptical	→ 5.
4. –	Leaves widest above the middle of the blade, slightly falcate; glands on base of blade, often small	→ *P. persica*
–	Leaves widest on the lower half of the blade; glands on petiole, often conspicuous	→ *P. dulcis*
5. –	Leaves broadly ovate to suborbicular; twigs red	→ *P. armeniaca*
–	Leaves ovate-oblong **or** obovate to elliptical; brown-red **or** green	→ 6.
6. –	Leaves ovate-oblong, clearly acuminate; margin irregularly serrate, with deep, obtuse teeth; 2 (3) glands on petiole, conspicuous, *reddish*; twigs brown-red; *flowers in umbels*	→ *P. avium*
–	Leaves broadly elliptical **or** obovate; margin finely serrate **or** crenate-serrate, with small teeth; glands *green*, on the petiole, prominent, **or** on base of blade, small; *flowers on long racemes **or** in pairs or solitary*	→ 7.
7. –	Leaves finely serrate and with 2 or more green glands on the petiole; *flowers on long racemes*	→ *P. padus*
–	Leaves crenate-serrate, with small teeth; small pale green glands on base of blade	→ *P. domestica*

Prunus armeniaca L.

Syn.: *Armeniaca vulgaris* Lam
E: Apricot
Sp: Damasco, albaricoquero, albergero, prisco, damasquillo

Fig. 13.75i: *P. armeniaca* L.: leaf

Deciduous small tree, up to 6 m tall. *Twigs and petioles* waxy red; young leaves reddish. *Leave-blade* broadly ovate to suborbicular, 5–10 cm long and 5–8 across, *base* truncate to subcordate, *margin* serrate; prominent *glands* along the petiole. *Flowers* solitary or in pairs: white or pink, 2.5 cm across. *Fruit* velutinous, ovoid, 4–8 cm long, yellow to orange.
Origin: Central Asia and China.
Hardiness: –20° C.
Uses in medicine: The seeds are used as expectorant. TCM.

Prunus avium L.

Syn.: *Cerasus avium* (L.) Moench
E: Gean, wild cherry
Sp: Cerezo, cerezo común, cerezo silvestre, guindo zorrero

Deciduous tree, up to 20 (30) m tall. *Bark* reddish-brown, smooth, ringed, peeling in horizontal bands. *Leave-blades* ovate-oblong or obovate-oblong, 8–15 cm long and 4–7 across, acuminate; margin irregularly serrate, with deep, obtuse teeth; *petiole* reddish, with 2–3 prominent, reddish glands near the blade. *Flowers* in sessile umbels, with long pedicels: white, 2–3 cm across. *Fruit* glabrous, globose, 0.9–1.2 cm across, yellow, red, or black.– Fl. 10–11. Fr. 1–2.
Origin: Europe, western Asia, northern Africa.
Hardiness: –32° C.

Uses:

a. Wood: Is in high esteem for furniture, panelling, veneers, musical instruments, turnery.

b. In medicine: The fruits contain tannins and have diuretic and astringent properties. TEM.

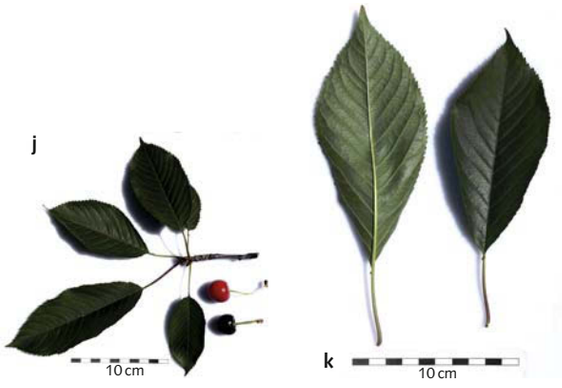


Fig. 13.75j,k: *P. avium* L.: **j:** twig; **k:** leaves

Fig. 13.75m: *P. cerasifera* Erh. var. *pissardii* (Carrière) Bailey: twig

2–3: white or pink, 2 cm across. *Fruit* glabrous, globose, 2.5–3 cm across, reddish.– Fl. 9–10. Fr. 1–2.

Origin: A cultivar from Iran.

Hardiness: –32° C.

Prunus cerasifera Erh. var. **pissardii** (Carrière) Bailey

E: purple-leaved plum, cherry plum, myrobalan plum

Sp: Ciruelo de jardín, ciruelo de flor, mirabolán, ciruelo japonés, mirobálano, mirobolano, ciruelo-cerezo

Fig. 13.75l: *P. cerasifera* Erh. var. *pissardii* (Carrière) Bailey: shape [Esquel]

Deciduous tree, up to 8 m tall. *Bark* dark brown. *Leave-blade* ovate, oval or obovate, up to 7 cm long and 2–3 across, almost black or dark purple; *margin* finely toothed; *glands* as small, shiny spots at the base of the blade (absent on several leaves). *Flowers* solitary or in groups of

Prunus domestica L.

E: Garden plum

Sp: Ciruelo, ciruelo europeo, cirolero

Fig. 13.75n,o: *P. domestica* L.: **n:** twig with fruit; **o:** leaves

Deciduous tree, up to 10 (12) m tall. *Bark* greyish-brown, fissured when old. *Leaf-blade* obovate to elliptic, 3–10 cm long and 1.8–5 across, dull green, the *underside* usually tomentose; *margin* crenate-serrate, with small teeth; *glands* small, pale green, at the base of the blade. *Flowers* in clusters of 2–3: white, 2–2.5 cm across. *Fruit* glabrous, sometimes tinged with wax, globose, 2–7.5 cm across, blue-black, purplish, red, yellow, green – depending on the variety.

Origin: Iran, Caucasus.

Hardiness: –28° C.

Uses in medicine: The bark contains a phenolic ketone with antifungal properties.

Prunus dulcis (Miller) Webb

Syn.: *Amygdalus communis* L., *Amygdalus dulcis* Miller, *Prunus amygdalus* Batsch, *Prunus communis* L.
E: Almond
Sp: Almendro

Fig. 13.75p: *P. dulcis* (Miller) Webb: twig

Fig. 13.75q: *P. dulcis* (Miller) Webb: leaf

Deciduous small tree or shrub, up to 8 m tall. *Leaf-blade* lanceolate, narrow, at least twice as long as wide, 4–12 cm long and 1.2–3 across, broadest on lower half of the blade; *margin* crenate-serrate; *glands* on petiole, often conspicuous. *Flowers* in pairs: bright pink in *bud*, fading to almost white when open, 3–5 cm across. *Fruit* tomentose, ovoid-oblong, compressed, 3.5–6 cm long, grey-green.
Origin: Central and south-western Asia, northern Africa.
Hardiness: –20° C.
Remark: The seeds of *P. dulcis* var. *amara* (DC.) Buchheim contain amygdalin, a highly toxic cyanogenic glycoside. It is used against cancer, although is efficacy is doubtful. TEM.

Fig. 13.75r: *P. dulcis* (Miller) Webb: flower

Prunus laurocerasus L.

Syn.: *Cerasus laurocerasus* (L.) Loisel., *Laurocerasus officinalis* M.J. Roemer
E: Cherry laurel, common laurel
Sp: Laurel cerezo, lauroceraso, laurel real, laurel romano

Fig. 13.75s: *P. laurocerasus* L.: shape[El Bolsón]

Evergreen tree or shrub, up to 8 m tall. *Leaf-blade* more or less oblong, 7.5–15 cm long and 2–5 across, thick, leathery, the u*pper side* glossy dark green, the *underside* paler; *margin* slightly serrate; *glands* 2–3, at base of the blade or on the petiole (absent on several leaves and in certain cultivars); *petiole and young twigs* pale green. *Flowers* in racemes, 6–12 cm long, equalling or only slightly exceeding their subtending leaves: white, 0.8 cm across. *Fruit* glabrous, ovoid, 2 cm across, black.– Fl. 11. Fr. 1–3.
Origin: South-western Asia and south-eastern Europe.
Hardiness: –20° C.
Remarks: The shape of the leaves varies according to the varieties and cultivars.– In *Prunus lusitanica* L. (*Cerasus lusitanica* (L.) Loisel.), the young twigs and the petioles are dark red, and the racemes usually extend well beyond the corresponding subtending leaves.

Fig. 13.75t: *P. laurocerasus* L.: leaf and inflorescence

Prunus padus L. (sensu lato)
Syn.: *Prunus racemosa* Lam., *Cerasus padus* (L.) *DC.*, *Cerasus padus* (L.) *Delarbre*
E: Bird cherry, European bird cherry
Sp: Cerezo-aliso; cerezo de San Gregorio

Fig. 13.75u: *P. padus* L.: twig with inflorescence

Fig. 13.75v: *P. padus* L.: leaves

Deciduous tree or shrub, up to 17 m tall; *crown* with ascending branches. *Bark* foetid. *Leaves* alternate, 6–10 cm long, stalked; *blade* obovate to elliptic-oblong, dull green on upper side, paler on underside; *apex* acuminate; *margin* finely serrate. *Flowers* on axillary racemes, carrying 15–35 flowers. *Petals* 6–9 mm, often erose-denticulate. *Fruit* a drupe, nearly globose, 6–8 mm across, shining black, bitter and astringent.
Status and distribution: Introduced; native to central and northern Europe. In Patagonia, ornamental.
Remark: P. padus is very showy; grows best on moist to wet soils.

Prunus persica (L.) Batsch
Syn.: *Prunus amygdalus* (L.) Batsch, *Prunus vulgaris* Miller
E: Peach
Sp: Duraznero, melocotonero, pavia

Deciduous small tree, up to 6 (8) m tall. *Twigs* and young leaves reddish. *Leaf-blade* oblong-lanceolate, acuminate, at least twice as long as wide, 5–15 cm long and 2–4 across, broadest above the middle of the blade; *margin* finely serrate; *glands* on base of blade, often small. *Flowers* solitary or in pairs: deep pink or red, 2–3.5 cm across. *Fruit* velutinous (except in var. *nucipersica* (Borkh.) C.K. Schneider, the nectarine, which is almost glabrous), 4–8 cm across, yellow to pale green.
Origin: China.
Hardiness: –16° C.

Pseudopanax laetevirens (Gay) Franchet
Syn.: *Aralia laetevirens* Gay, *Aralia paniculata* Phil., *Cheirodendron laetevirens* (Gay) Seem., *Pseudopanax racemiflorum* (Miq.) Ball, *Sciadophyllum racemiflorum* Miq.
E: ?
Sp: Sauco cimarrón, sauco del diablo, traumén, curacó (in Mapuche)
Fam. Araliaceae

Fig. 13.76a: *Pseudopanax laetevirens* (Gay) Franchet: twig

Fig. 13.76b: *Pseudopanax laetevirens* (Gay) Franchet: leaves

Evergreen tree or shrub, up to 8 m tall, richly branched; *crown* spherical. *Bark* ash-grey. *Leaves* alternate, palmatisect, with petioles 4–8 cm long; *leaflets* elliptic-lanceolate, 3–8 cm long, *margin* serrate. *Flowers* borne in umbels arranged in panicles: *greenish*, 3.5–4 cm long, pedicellate; *calyx* with 5 teeth; *petals* 5; *stamens* 5; *gynoecium* with an *inferior*, pentalocular ovary. *Fruit* a blue berry.– Fl. 11–2. Fr. 11–2.

Status and distribution: Native; in Argentina: CHU, NE, RN, SC; in Chile: from the Prov. of Linares to the farthest south (Regions VII-XII).

Habitat: Riverbanks, shores of lakes, and in humid forests, thereby associated with species as *Drimys winteri*, *Embothrium coccineum*, *Laureliopsis philippiana*, *Nothofagus betuloides*, *Nothofagus dombeyi*, *Pilgerodendron uviferum*, *Weinmannia trichosperma*.

Elevation: 0–1000 m.

Uses: An ornamental species for public places and shady gardens. It is planted to protect watercourses.

Uses in popular medicine: The boiled bark as a sudorific. TSAM.

Quercus L.

Fam. Fagaceae

Deciduous or evergreen, monoecious trees or shrubs. *Leaves* alternate, simple, stalked; *blade and margin* pinnatifid or parted or serrate or entire. *Male flowers* in drooping catkins; *female flowers* solitary or in pairs or in multi-floral spikes, surrounded by an involucre of many bracts. *Fruit* an ovoid, oblong or sub-globose acorn, sitting in an open cupule of overlapping scales.– Fl. 10–11. Fr. 4.

The genus *Quercus* comprises about 200 species, native to the northern hemisphere. In Patagonia, particularly two species are cultivated, due to their ornamental properties:

Q. robur L. and *Q. palustris* Münchhausen. In more temperate areas (e.g. El Bolsón; Neuquén), also *Quercus rubra* L. and *Quercus suber* L. are grown in gardens and parks.

Uses:

a. Wood and bark: *Q. robur* and *Q. rubra* have numerous uses. Their resistant wood is highly appreciated for furniture, veneers, floors, barrels, for construction, sea defences, etc., and it is used as firewood. The bark of *Q. suber* is the raw material for all types of cork.

b. In medicine: The cork of *Q. suber* contains friedelin, a triterpenoid with diuretic properties. The species of the genus *Quercus* contain several tannins (e.g. pedunculagin, tellimagrandin I) with anti-diarrhoeal, astringent and antimicrobial properties; also with (*in vitro*) antihepatotoxic activities. TEM.

Remark: Foliage, bark, and fruits of *Q. robur* are toxic for cattle and horses; the fruits can be poisonous for humans.

Fig. 13.77a1: *Quercus robur* L.: shape [Valdivia]

Fig. 13.77a2: *Quercus robur* L.: shape of millenary oak [Dornach, Switzerland]

Quercus robur L.

Syn.: *Quercus pedunculata* Ehrh.
E: English oak, pedunculate oak, common oak
Sp: Roble europeo, carvallo, carballo, carvayo, roble pedunculado, roble albar, roble común, roble, roble de Eslavonia. encina inglesa
†, (†)

Fig. 13.77b: *Quercus robur* L.: twig with male flowers

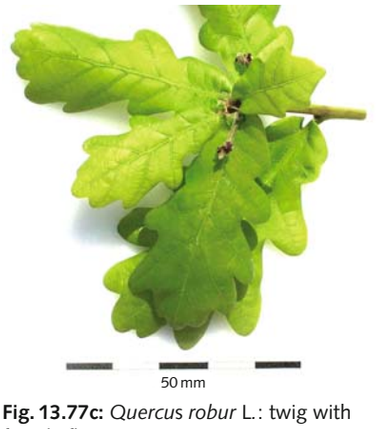


Fig. 13.77c: *Quercus robur* L.: twig with female flowers

Fig. 13.77d: *Quercus robur* L.: twig with fruit

Quercus palustris Münchhausen

E: Pin oak, marsh oak
Sp: Roble de los pantanos, roble palustre

Fig. 13.77e: Comparison of *Q. robur* (left) vs. *Q. palustris*: leaves

Quercus rubra L.

Syn.: *Quercus borealis* Michx
E: Red oak, live oak, northern red oak
Sp:Roble americano, roble rojo, roble americano rojo

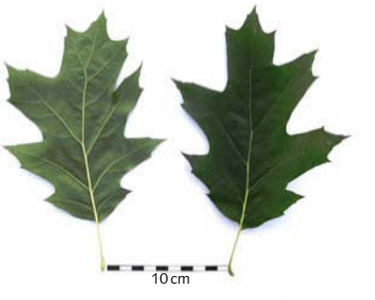


Fig. 13.77f: *Quercus rubra* L.: leaves

Quercus suber L.

Syn.: *Quercus occidentalis* Gay
E: Cork oak
Sp: Alcornoque, árbol del corcho, surena, sureira, alsina, chaparro

Fig. 13.77g: *Quercus suber* L.: twig

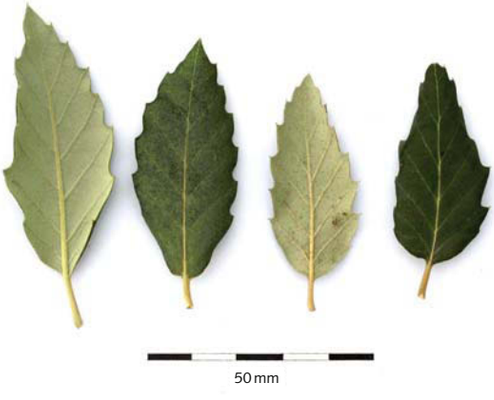


Fig. 13.77h: *Quercus suber* L.: leaves

Fig. 13.77i: *Quercus suber* L.: bark

Characters	*Quercus robur*	*Quercus palustris*	*Quercus rubra*	*Quercus suber*
Height, crown	up to 45 m tall, *crown* subglobose	up to 26 m tall, *crown* pyramidal; *twigs* somewhat pendent	up to 25 m tall, *crown* globose; *twigs* not pendent	up to 20 m tall, *crown* irregular
Bark	pale grey, thick, wrinkled, deeply fissured	grey, smooth, furrowed with age	chestnut-brown, smooth, fissured	thick, corky
Leaves	deciduous, obovate-oblong, somewhat leathery, dark green, brown in autumn, 5–15 cm long, *petiole* 2–7 mm; *blade* with 3–6 pairs of rounded lobes, *base* auriculate	deciduous, obovate, papyraceous, glossy green, scarlet in autumn, 8–15 cm long, 5–10 cm wide, *petiole* 1–3 cm; *blade* parted, deeply lobed, lobes acuminate, *base* cuneate	deciduous, ovate to obovate, glossy green, scarlet in autumn, 12–20 cm long, 10–15 cm wide, *petiole* 2.5–5 cm; *blade* cleft, lobed about half-way to midrib, lobes acuminate, *base* cuneate	evergreen, ovate-oblong, leathery, *upper side* dark green, *under-side* grey-tomentose, 3–7 cm long, *petiole* 0.8–1.5 cm; *blade* sinuate-dentate
Fruits	oblong, 2–4 cm long	sub-globose; 1.2–1.7 cm long	sub-globose; 2–3 cm long	ovoid; 2–4.5 cm long
Origin	Europe, western Asia	eastern North America	eastern North America	southern Europe; usually *calcifuge*!
Hardiness	–28° C	–28° C	–28° C	–16° C

Rhaphithamnus spinosus (Juss.) Moldenke
Syn.: *Rhaphithamnus cyanocarpum* Miers, *Volkameria spinosa* Juss
E: Spiny arrayan
Sp: Espino azul, arrayán macho, espino blanco, huayún, repu, arrayán de espino, guayán
Fam. Verbenaceae

Fig. 13.78a: *Rhaphithamnus spinosus* (Juss.) Moldenke: twig

Evergreen, richly branched shrub or tree, up to 7 m tall. *Young branches* densely tomentose; *axillary thorns* usually well developed. *Leaves* opposite, simple, 0.7–3.5 cm long and 0.5–2.5 cm across, briefly stalked; *blade* ovate, leathery, *upper side* dark green, *underside* light green; *apex* acute-mucronate or shortly acuminate; *margin* entire. *Flowers* usually solitary, pedunculate, dark-violet, tubular; *calyx* bell-shaped, pubescent, with 4 teeth; *corolla* tubular; *stamens* 4; *gynoecium* formed by 2 united carpels. *Fruit* a violet-blue spherical drupe.– Fl. 9–1. Fr. 12–3.

Fig. 13.78b: *Rhaphithamnus spinosus* (Juss.) Moldenke: flowers

Status and distribution: Native; in Argentina: NE, RN, above all in the PN Lago Puelo and in the PN Los Alerces; in Chile: from the Prov. of Limarí to the Prov. of Aisén (Regions IV–XI).

Fig. 13.78c: *Rhaphithamnus spinosus* (Juss.) Moldenke: twig with fruits

Hábitat: Mainly in forests of gorges, and on moist soils bordering lakes and ponds; however, also on comparatively dry soils.
Elevation: 0–1000 m.
Uses: A widely appreciated ornamental species.

Robinia pseudoacacia L.
E: Black locust, locust tree, false acacia
Sp: Acacia blanca, robinia, falsa acacia, acacia de flor blanca, acacia bastarda, pan y quesillos, acacia común, acacio
Fam. Fabaceae
††

Fig. 13.79a: *Robinia pseudoacacia* L.: leaf-buds, young leaves

Deciduous tree, up to 25 m tall; *crown* broad. Bark grey-brown, deeply fissured, with scaly ridges. *Branches* somewhat tortuous, *twigs* with the *stipules* transformed into spines. *Leaves* alternate, compound, odd-pinnate,

Fig. 13.79b: *Robinia pseudoacacia* L.: leaf, underside

Fig. 13.79c: *Robinia pseudoacacia* L.: leaf, upper side

20–35 cm long, 20–35 cm long, petiole articulate at base; *blade* of 3–11 (19) pairs of leaflets, 2.5–4.5 cm long, subopposite, ovate, rounded, slightly truncate at the base and with a short mucro at the apex, margin entire. The leaves fold themselves in the evening. *Flowers* on axillary pendulous, dense racemes, 10–20 cm long: pea-like, white (*standard* with yellow spot at base), very fragrant; calyx campanulate, red-brown; *corolla* 1.5–2 cm long, with standard, wings, and keel; *stamens* 10, 9 joined, 1 free; *gynoecium* of one carpel. *Fruit* a flat legume, 5–12 cm long and 1–1.5 across. *Seeds* 3–18, reddish-brown.– Fl. 11–12. Fr. 2–6.

Status and distribution: Introduced, in certain areas naturalized; native in central and eastern USA. A species of large ecological amplitude.

Fig. 13.79d,e: *Robinia pseudoacacia* L.: **d:** inflorescence; **e:** bark

Elevation: 0–1600 m. In Patagonia, appreciated as an ornamental species. Also used to shelter plantations and for afforestation on dry, sandy soils.

Hardiness: –32° C.

Uses:

a. Wood: For furniture, veneers, construction, piling, fencing, etc.

b. In medicine: The essential oil of the flowers contains piperonal, a phenol used in perfumery, in cherry and vanilla flavours; also used as a pediculicide. *Robinia* also contains the flavonols robinetin and robinin, which have antibacterial properties. Bark and leaves are used against migraine. TNAM.

Remarks:

a. The whole plant is very poisonous, due to the content of robinin and phasin.– See also *Sophora japonica* → Remarks.

b. R. pseudoacacia is highly competitive and reproduces also by root suckering. It can be used to control erosion on degraded soils; but it can also become an invasive species (see GISD).

Rosa rubiginosa L.

Syn.: *Rosa eglanteria* L., nom. ambig.
E: Sweet brier, eglantine
Sp: Mosqueta, rosa silvestre, rosa del campo, coral, rosa mosqueta, pica-pica
Fam. Rosaceae

Fig. 13.80a: an entire slope overgrown with *Rosa rubiginosa* [Cholila]

Shrub, 1–3 m tall, upright, richly branched. *Branches* arched, aculeate, prickles strong, purple. *Leaves* alternate, compound, stipulate, odd-pinnate; *blade* with 5–7 leaflets; *leaflets* ovate to elliptic, 1–3 cm long, glanduliferous on the underside, *apex* acute or acuminate, *margin* serrate; *rachis* with small prickles on the underside. *Flowers* solitary

Fig. 13.80b: *Rosa rubiginos*a L.: shape, in flower [Valdivia] (with the permission of P. Lépez.)

or in groups of three. 3–5 cm in diameter, pink, with a hispid-glanduliferous peduncle and *hypanthium*; *sepals* 5; *petals* 5, free; *stamens* numerous; *gynoecium* composed of numerous free carpels, their ovaries being *inferior*, borne within the hypanthium. *Fruit:* The hypanthium develops into an orange or scarlet coloured berry-like hip which contains the achenes. Fl. 10–12. Fr. 1–3.

Fig. 13.80c: *Rosa rubiginos*a L.: flower

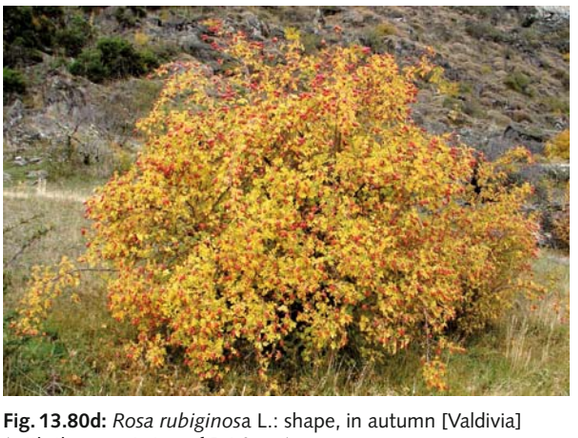


Fig. 13.80d: *Rosa rubiginos*a L.: shape, in autumn [Valdivia] (with the permission of P. Lépez.)

Fig. 13.80e: *Rosa rubiginos*a L.: twig

Fig. 13.80f: *Rosa rubiginos*a L.: leaves

Status and distribution: Introduced, native to Europe, northern Africa and western Asia; adventitious in Patagonia; in Argentina: very widespread and invasive in CHU, NE, RN; in Chile: from Santiago to Aisén (Regions V–XI).

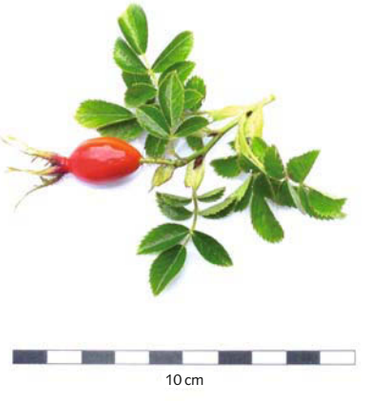


Fig. 13.80g: *Rosa rubiginos*a L.: twig with fruit

Habitat: Usually on degraded grounds exposed to sunshine, also bordering roads and marshes.
Uses: Ripe hypanthia are used to prepare jam. The essential oils of the flowers are used for cosmetics. It is also an ornamental species.
Uses in medicine: The red fruit pigment cyanidin-3-*O*-galactoside, an anthocyanin, has anti-inflammatory properties, and is used in the prevention of capillary fragility. The leaves of *Rosa* spp. contain pentagalloyl-β-D-glucose, a tannin with antiviral activity against human immunodeficiency virus. In popular medicine, the infusion of the petals is used against stomach upsets and against conjunctivitis; the infusion of the fruits, against colds. TEM.

Salix caprea L.

Syn.: *Salix coaetanea* (Hartmann) B. Flod.
E: Goat willow
Sp: Mimbre japonés, sauce, sauce cabruno
Fam. Salicaceae

Fig. 13.81a: *Salix caprea* L.: twig

Deciduous, dioecious shrub or small tree, up to 11 m tall, having a rounded *crown* and upright branches. *Bark* greenish-grey, smooth, coarsely fissured with age. Decorticated *branches without* longitudinal ridges. *Twigs* hairy, becoming glabrous and greenish in the second year; *buds* large, reddish or woolly. *Leaves* alternate, 4–11 cm long and 2–6 cm across, with a 1–2 cm long stalk and semicordate, toothed *stipules*; *blade* elliptic to broadly oval and oblong, its *base* rounded or slightly heart-shaped, and its *apex* pointed; *upper side* dark green, *underside* whitish-grey and pubescent; *margin* usually sinuate or irregularly crenate-serrate, occasionally entire. The 6–9 *lateral veins* form a nearly right angle with the midrib. *Flowers* in axillary catkins which appear before the leaves: the *male* ones 2–3.5 cm long, ovoid, with yellow stamens; the *female* ones 3–7 cm long. *Fruit* a conical, whitish capsule, borne on a pedicel.– Fl. 8–9.

Fig. 13.81b: *Salix caprea* L.: leaves

Status and distribution: Introduced; native to Europe and north-western Asia.
Habitat: On moist soils of changing humidity.–
Hardiness: –32°C.
Uses:
a. Wood: Soft, elastic, used as stakes for grapes and for making charcoal and gunpowder: The bark is rich in tannins.
b. Beekeeping and floral bouquets: The plants bloom towards the end of winter and are eagerly searched for by bees who load themselves with its pollen. The flowering branches are widely used in bouquets.

Salix fragilis L.

E: Crack willow
Sp: Mimbrote negro, sauce, mimbrera, salgueiro, aratxa, vimanera
Fam. Salicaceae

Fig. 13.82a: *Salix fragilis* L.: shape of a small forest [Río Coyle]

Deciduous, dioecious tree or shrub, up to 15 (20) [30] m tall; *crown* rounded, in open globes. *Bark* grey or dark-grey, thick, wrinkled and fissured. *Young branches* long, pendulate, shiny, easy to break, above all where they bifurcate. *Leaves* alternate, 6–16 cm long and 3 across, with a petiole 1–2 cm long, sometimes bearing glands on its upper end; *blade* long-lanceolate, *upper side* dark-green, *underside* blue-white or bluish-green; *apex* elongated, acuminate, slightly falcate; *margin* finely serrate. *Flowers* in axillary catkins to 6 cm long: very small, the *male* ones yellowish, the *female* ones greenish. *Fruit* a capsule. *Seeds* fluffy.– Fl. 10–11. Fr. 11–12.

Status and distribution: Introduced, naturalized, native to Europe; in Argentina: BA, CHU, ER, NE, RN; in Chile: (?).

Habitat: in Argentine Patagonia along watercourses, marshes.

Elevation: 0–500m.

Hardiness: –32° C.

Uses:

a. Wood: Pale, smooth, easy to work: used e.g. for cricket bats and in orthopaedics. The twigs are used for wickerwork.

b. In medicine: Particularly the bark of several species of *Salix* is rich in phenolic glycosides (e.g. salicin, drug on which "Aspirin" is based) with anti-inflammatory, anti-rheumatic and analgesic effects. TEM.

Remarks: S. fragilis has become the dominant species of *Salix* in Argentine Patagonia. It spreads asexually through fallen twigs that subsequently root. *S. humboldtiana* Willd. (Syn.: *Salix martiana* Leyb.), a widespread native species, is not frequent in Patagonia, where it can be found bordering the rivers Chubut, Limay, R. Negro and R. Colorado: its shortly stalked *leaves* are linear-lanceolate, 3–10 (15) cm long and 0.5–1.5 across, glabrous, bright green, with a tapering *apex* and a serrate *margin*. There are, however, other introduced and to some extent naturalized Salicaceae in Patagonia, e.g.: *S. viminalis* L. (Syn.: *S. veriviminales* Nasarow, *S. rossica* Nasarow, *S. linearis* Turcz., common osier, basket willow), from Europe and Asia, with linear *leaves*, 10–20 cm long, the *underside* being silvery glossy, the *margin* somewhat undulate and turned under – quite frequent in the southernmost regions of Patagonia, used for hedges and for manufacturing baskets; *S. alba* L. (white willow), from Europe, Asia and northern Africa, with oblong-lanceolate *leaves*, 7–12 cm long and 1–3 across, tapering, the *upper side* dark green, the *underside* glaucous or silvery, *margin* serrate. – A classical ornamental tree in public places and gardens is

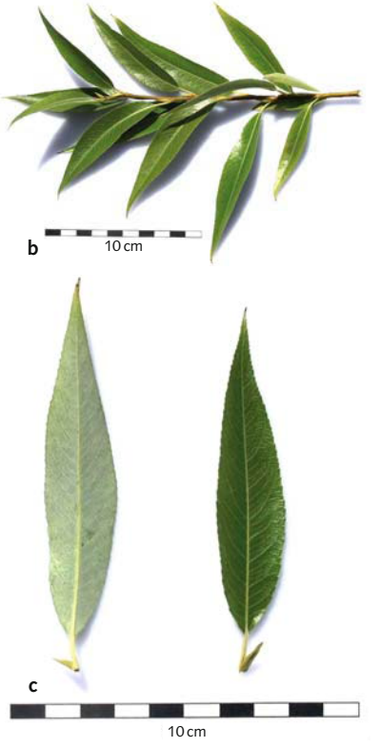


Fig. 13.82b,c: *Salix fragilis* L.: **b:** twig; **c:** leaves

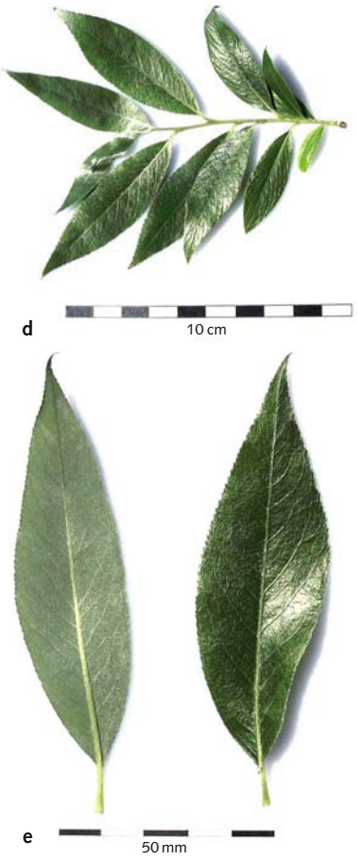


Fig. 13.82d,e: *Salix alba* L: **d:** twig; **e:** leaves

Fig. 13.82f: *Salix babylonica* L.: shape [El Bolsón]

S. babylonica L. (Syn.: *S. elegantissima* C. Koch; Chinese weeping willow, weeping willow) – from China, easily recognizable by its pendulous, yellowish, flexible *twigs*, bearing narrowly lanceolate leaves, with an acuminate *apex* and a serrate *margin*.

Fig. 13.82g: *Salix babylonica* L.: twig

Fig. 13.82h: *Salix babylonica* L.: leaves

Fig. 13.82i: *Salix humboldtiana* Willd.: twig of male plant, with details of a flower (**1**,**2**) and a stamen (**3**) [ex A. Humboldt et al., 1817; Turpin del. (Zentralbibliothek Zürich. Alte Drucke)]

Fig. 13.82j: *Salix humboldtiana* Willd.: twig of female plant, with details of a young gynoecium (**1**,**2**), a fruit (capsule) (**3**,**5**), and a seed (**4**). [ex A. Humboldt et al., 1817; Turpin del. (Zentralbibliothek Zürich. Alte Drucke)]

Fig. 13.82k: *Salix viminalis* L.: shape [Río Gallegos]

Fig. 13.82l: *Salix viminalis* L.: twig

Fig. 13.82m: *Salix viminalis* L.: leaves

Sambucus nigra L.

E: Elder, bourtree, European elder
Sp: Saúco, saúco canario, sabuco
Fam. Caprifoliaceae
(†)

Deciduous tree or shrub, up to 10 m tall; *crown* rounded, dense. *Bark* grey-brown, deeply fissured, with soft, corky ridges. *Branches* arch towards the ground. *Leaves* opposite and decussate, compound, odd-pinnate, stalked; *leaflets* 5–7, narrowly ovate or elliptic, 4–12 cm long and 1.5–4 across, dark green on both sides; *margin* finely serrate. Twigs and leaves emanate a heavy, rather unpleasant odour. *Flowers* in corymbiform cymes, at first erect, later drooping, 10–20 cm across, with reddish pedicels: white, small, fragrant; *calyx* 5-toothed; *corolla* 5-lobed; *stamens* 5; *ovary* inferior, usually trilocular. *Fruit* a black drupe, 6–8 mm across; fruits used to prepare jam, syrups or soft drinks.– Fl. 12–1. Fr. 2–3.

Status and distribution: Introduced; native to northern Africa, Europe, and western Asia.

Habitat: Along water courses, on fresh, moist soils. In Patagonia, profusely cultivated in the entire Andean-Patagonian region.

Hardiness: –28° C (?).

Uses in medicine: The leaves contain the toxic glycosides prunasin and zierin. The flowers are used in teas against respiratory diseases; the fruits, as laxatives. TEM.

Fig. 13.83a: *Sambucus nigra* L.: twig

Fig. 13.83b: *Sambucus nigra* L.: leaves

Fig. 13.83c: *Sambucus nigra* L.: inflorescence

Fig. 13.83d: *Sambucus nigra* L.: fruits

Schinus areira L.

Syn.: *Schinus molle* L. var. *areira* (L.) DC.
E: Pepper tree, California pepper
Sp: Aguaribay, pimentero, falso pimentero, pimiento, árbol de la pimienta, bálsamo, curanguay, gualeguay, terebinto, molle
Fam. Anacardiaceae

Fig. 13.84a: *Schinus areira* L.: shape [Trelew]

Evergreen, polygamous-dioecious tree, up to 25 m tall, having a richly branched *crown* with slender, drooping twigs. *Bark* from dark-brown to reddish, fissured, rough. *Leaves* alternate, usually odd-pinnate (sometimes even-pinnate), 10–21 cm long, with a petiole (2–5 cm); *blade* composed of 10–40 opposite, sub-opposite or alternate *leaflets*, 1–6 cm long and 0.3–1 cm across, from leathery to membranous, glossy green, glabrous, lanceolate; apex often curved, tapering; *margin* entire or serrate. *Inflorescence* axillary, 10–20 cm long. *Flowers* small, white to greenish-white; *male flowers* with 5 petals, 1.3–2 mm long, and 10 *stamens*; *hermaphroditic flowers* with stamens that are much shorter than the petals; ovary tricarpellate, unilocular. *Fruit* a globose drupe, 4–7 mm across.

Status and distribution: Native; in Argentina: CA, CO, JU, LR, SA, SL, TU; in Chile: Regions I–VI.

Elevation: 0–3000 m.

Uses: A species with a wide range of uses: planted for windbreaks and for stabilizing soil; the leaves provide green manure and have insecticidal properties; the wood is used as fuel, and the essential oils for perfumery; besides, they have bactericide activity. TSAM.– In Patagonia, planted as an appreciated ornamental species in places and gardens, above all in the more temperate zones.

Remark: Whereas *S. areira* generally develops terminal leaflets and inflorescences that surpass the length of the glabrous leaves, the closely related *S. molle* L. (*S. molle* L. var. *rusbyi* Barkley) usually has even-pinnate leaves (lacking a terminal leaflet), and its inflorescences are mostly shorter than its hairy leaves.

Fig. 13.84b: *Schinus areira* L.: twigs with fruits

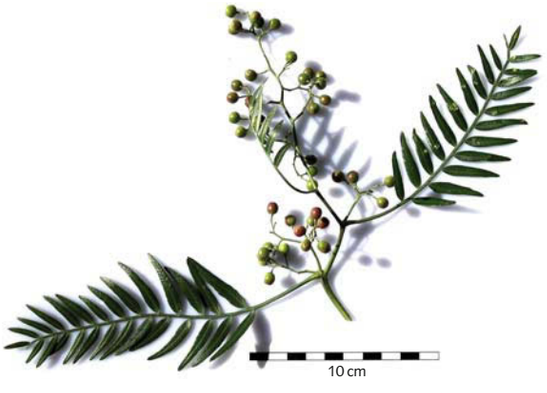


Fig. 13.84c: *Schinus areira* L.: leaves with fruits

Schinus patagonica (Phil.) I.M. Johnst.
Syn.: *Duvana patagonica* Phil., *Litrea montana* Phil. var. *patagonica* Phil., *Litrea patagonica* Phil., *Schinus crenata* Engl., *Schinus montana* (Phil.) Engl. var. *patagonica* Reiche
E: ?
Sp: Laura, muchi, litre (in Mapuche)
Fam. Anacardiaceae

Fig. 13.85a: *Schinus patagonica* (Phil.) I.M. Johnst.: shape [Los Antiguos]

Evergreen, richly branched shrub, 1–3 m tall. *Young branches* red or chestnut-coloured. *Leaves* alternate, 2–5.5 cm long, briefly stalked; *blade* ovate to elliptical; *margin* entire or crenate (above all towatds the apex); *apex* obtuse or emarginate. *Flowers* in axillary racemes which are shorter than the leaves: light-green, small. *Fruit* a spherical drupe, lilac-coloured, with a leathery epicarp and a fleshy mesocarp.
Status and distribution: Native; in Argentina: CHU, ME, NE, RN; in Chile: in the mountain chains of Chillán and Valdivia (Regions VIII–X [XIV, since 2007]).
Habitat: Mainly on sunny slopes, in the areas of transition between forest and steppe.
Elevation: 500–2000 m.
Uses in popular medicine: Against rheumatism. TSAM.

Fig. 13.85b: *Schinus patagonica* (Phil.) I.M. Johnst.: branch

Fig. 13.85c: *Schinus patagonica* (Phil.) I.M. Johnst.: leaves

Sophora japonica L.
Syn.: *Styphnolobium japonicum* (L.) Schott
E: Pagoda tree, Chinese scholar tree, Japan pagoda tree, scholar's tree
Sp: Sófora, acacia del Japón, acacio japonés, árbol de las pagodas
Fam. Fabaceae
††

Fig. 13.86a: *Sophora japonica* L.: shape

Deciduous tree, up to 25 m tall; *crown* broad, rounded. *Bark* grey-brown, fissured, with prominent ridges. *Branches* without spines, dark green when young. *Leaves* alternate, odd-pinnate, up to 25 cm long, stalk swollen at base; *blade* with 7–17 ovate to ovate-lanceolate, pointed leaflets, 3–5 cm long and 2–2.5 cm across, *upper side* dark green, *underside* bluish-green and slightly hairy; in autumn, some leaves turn yellow before falling. *Flowers* in terminal or axillary up to 35 cm long panicles, yellowish-white, fragrant, pea-like, 1.5–2 cm long. *Fruit* an indehiscent, hanging legume, 5–7.5 cm long, constricted between the seeds. *Seeds* 2–5, black.– Fl. 1–2. Fr. 3.

Fig. 13.86b: *Sophora japonica* L.: bark

Status and distribution: Introduced; native to China, cultivated in Japan for centuries. In Patagonia, ornamental, not frequent.
Hardiness: –28° C.

Fig. 13.86c: *Sophora japonica* L.: branch

Remarks: An elegant tree for large patios and places.– *Sophora japonica* can easily be distinguished from *Robinia pseudacacia* by lacking thorns, having clearly pointed leaflets, blooming in summer (January, February), and having a bark fissured more superficially.
Uses in medicine: Sophora spp. contain (above all in the bark, the fruits and the seeds) anagyrine and cytisine, highly toxic alkaloids. Anagyrine is also teratogenic and induces tachycardia. Cytisine is teratogenic in rabbits and poultry; it is a respiratory stimulant and it is hallucinogenic. They also contain the alkaloid matrin, which has anti-ulcer, antitumour and antibacterial activities. MM.

Fig. 13.86d: *Sophora japonica* L.: leaves

Fig. 13.86e: *Sophora japonica* L.: flowers and fruits

Sophora microphylla Aiton
Syn.: *Sophora tetraptera* Reiche, *Sophora tetraptera* J.F. Miller var. *microphylla* (Aiton) Hook.f., *Edwardsia microphylla* Salisb., *Edwardsia cassioides* Phil.
E: Kowhai
Sp: Pelú, pilo, mayu-monte, toromiro, sófora de hojas pequeñas
Fam. Fabaceae

Evergreen small tree or shrub, up to 10 m tall, with a straight *stem*. *Bark* grey to grey-brown, smooth, with lenticels. *Leaves* alternate, odd-pinnate, up to 15 cm long; *blade* composed of 10–37 pairs of obovate-oblong leaflets, 0.5–1.5 cm long, with an entire margin, *upper side* dark green, glabrous, *underside* of a lighter green, somewhat hairy an reddish in young leaves. *Flowers* in hanging racemes of 2–7 units, pea-like, yellow. *Fruit* a cylindrical, 4-winged legume, up to 15 cm long, swollen in intervals. *Seeds* 2–8, brown.– Fl. 8–10. Fr. 11–12.
Status and distribution: Native to Chile and New Zealand. In Chile, above all from the south of the río Maule to the Prov. of Aisén (Regions VII - XI).
Habitat: Along water courses, in the shadow, on deep soils.
Elevation: 0–500 m.
Uses: Hard, rot-proof wood, used for handles of tools. Besides, appreciated as an ornamental species.

Fig. 13.87a: *Sophora microphylla* Aiton: twig

Fig. 13.87b,c: *Sophora microphylla* Aiton: **b:** bud of flower; **c:** flower

Fig. 13.87d: *Sophora microphylla* Aiton: fruit

Sorbus L.

Fam. Rosaceae

Deciduous trees or shrubs without spines. *Buds* rather large, with overlapping scales. *Leaves* alternate, simple, lobed or pinnate. *Flowers* in compound corymbs: *hypanthium* ovoid; *sepals* 5, on the rim of the receptacle; *petals* 5, white, rarely pink; *stamens* 15–25; *carpels* 2–5, partly free or connate, *ovary* inferior, bi-ovulate, *styles* free or connate at base. *Fruit* a berry-like hip, with the remains of the sepals on the top.– Fl. 11–12. Fr. 3–5.

A genus of about 80 species, native to the temperate zones of the northern hemisphere.

Sorbus aria (L.) Crantz

E: Whitebeam, common whitebeam
Sp: Mostajo, mostellar, mochera

Tree, up to 25 m tall; *crown* broadly columnar. *Bark* greyish, smooth, becoming fissured with age. *Leaves* alternate, simple, shortly petiolate; *blade* ovate, oval or elliptic, 6–12 cm long and 4–8 across, leathery to membranous, *upper side* glossy deep green, *underside* white, tomentose; *margin* entire at base, elsewhere bi-serrate. *Young leaves* whitish, tomentose. *Flowers* in scarcely branched corymbs: white, 1 cm across. *Fruit* ovoid, 1–1.5 cm across, orange-red.

Origin: Europe, western Asia, northern Africa. In Patagonia, popular in urban green spaces.

Hardiness: –20° C.

Fig. 13.88a: *Sorbus aria* (L.) Crantz: shape [El Bolsón]

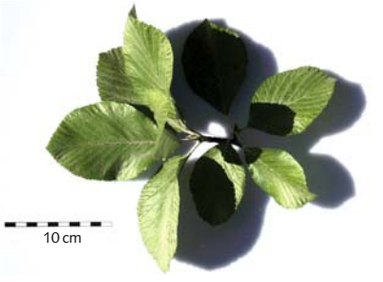


Fig. 13.88b: *Sorbus aria* (L.) Crantz: branch

Fig. 13.88c: *Sorbus aria* (L.) Crantz: leaves

Sorbus aucuparia L.

E: Rowan, European mountain ash
Sp: Serbal, serbal de los cazadores, serbal silvestre
(†)

Tree, up to 15 m tall; *crown* broadly conical. *Bark* grey, smooth and shiny. *Winter-buds* asymmetrically pointed, purplish-brown, hairy. *Young twigs* pubescent, greyish-brown when older. *Leaves* alternate, odd-pinnate, 10–25 cm long, petiole 1–3 cm; petiole and *rachis* reddish; *leaflets* in usually 6–7 pairs, oblong-lanceolate, up to 6 cm long, the terminal leaflet slightly smaller as the others; *base* rounded to cuneate, often slightly oblique; *margin* entire near base of leaflet, sharply serrate above, not pungent; *upper side* dark green, *underside* blue-green. The leaves can turn red in autumn. *Flowers* white, 0.8 cm across, emanating a somewhat unpleasant odour. *Fruits* red (yellow in var. *xanthocarpa* (Hartw. et Rümpl.) Rehder), often in heavy clusters.

Origin: Europe and Asia. In Patagonia, a favourite in urban green places.

Hardiness: –36° C.

Remarks: Several cultivars, subspecies, and crosses with *S. aria* are quite common. The fruits can be poisonous when consumed raw, but are used to prepare jellies and preserves.

S. americana Marshall (American mountain ash) is a related species having glabrous winter-buds, and slender, acuminate leaflets, often longer than 9 cm.

Fig. 13.89a: *Sorbus aucuparia* L.: bark

S. domestica L. (service tree), native to southern and eastern Europe, has been cultivated for its edible, pear-like fruits since antiquity. Quite similar to *S. aucuparia*, it can be distinguished from it in its vegetative state by its gluey buds and its bark, which in older specimens is fissured and cracks into plates.

Hardiness: –20° C.

Uses:

a. Wood: For furniture, decorative work, and as firewood.

b. In medicine: The heartwood of *S. aucuparia* contains the phenolic aucuparin, which shows antifugal activity. The fruit *S. aucuparia* and other *Sorbus* spp. carries the mildly toxic aliphatic parasorbic acid. The fruit of *S. aucuparia* also contains D-sorbitol, used as sweetener for diabetics. TEM.

Fig. 13.89b: *Sorbus aucuparia* L.: twig with flowers

Fig. 13.89c: *Sorbus aucuparia* L.: twig with fruits

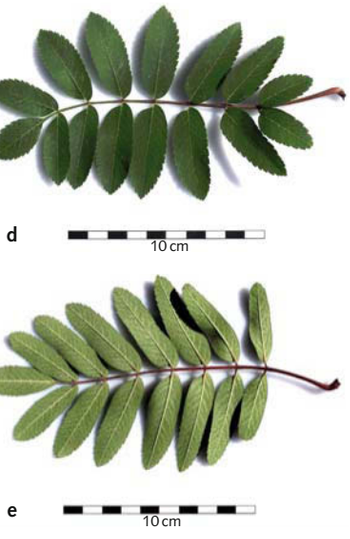


Fig. 13.89d,e: *Sorbus aucuparia* L.: **d:** leaf, upper side; **e:** leaf, underside

Fig. 13.90a: *Syringa vulgaris* L.: twig

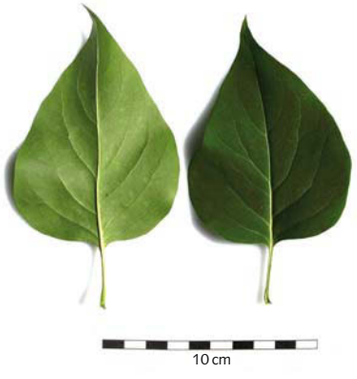


Fig. 13.90b: *Syringa vulgaris* L.: leaves

Syringa vulgaris L.

E: Common lilac
Sp: Lila, lilo
Fam. Oleaceae

Deciduous shrub or small tree, up to 7 m tall. *Bark* grey-brown. *Twigs* olive-green, smooth, somewhat hairy. *Leaves* opposite, simple, stalked; *blade* ovate-acuminate, 5–12 cm long, *base* cordate or rounded, *upper side* deep green, *underside* paler; *margin* entire. *Flowers* in large, 10–20 cm long, conical thyrses: fragrant, dark violet, light violet, or white; *calyx* of 4 persistent sepals; *corolla* tubular, 8–12 mm long, with 4 spread out lobes; *stamens* 2; *ovary* bilocular, the locules bi-ovulate. *Fruit* an ovoid-elongated capsule.– Fl. 11–12.

Status and distribution: Introduced; native to south-western Europe. In Patagonia, frequently cultivated, above all along the Atlantic coast.

Uses in medicine: Leaves and flowers contain phenolic acids and have stomachic and anti-fever effects. TEM.

Tamarix gallica L.

Syn.: *Tamarix anglica* Webb
E: French tamarisk, salt cedar
Sp: Taray, taray de Europa, tamarisco, taraje, atarfe
Fam. Tamaricaceae

Deciduous small tree or shrub, up to 4 (10) m tall. *Branches* slender, flexible, purplish-brown. *Leaves* alternate, embracing the twig, scale-like, ovate, acute, sessile, bluish-green. *Flowers* in sub-terminal 3–5 cm long panicles on shoots of the season: small, white or pink; *sepals* 5; *petals* 5, more than 1.5 mm long, early-falling; *stamens* 5; *ovary* unilocular, pluriovulate. *Fruit* a small pyramidal capsule.– Fl. 1–3.

Status and distribution: Introduced; native to northern Africa and south-western Europe. Vastly employed for dune fixation and to cultivate arid areas. In Patagonia, frequent along the Atlantic coast.

Hardiness: –20° C.

Fig. 13.91a: *Tamarix* gallica L.: twig

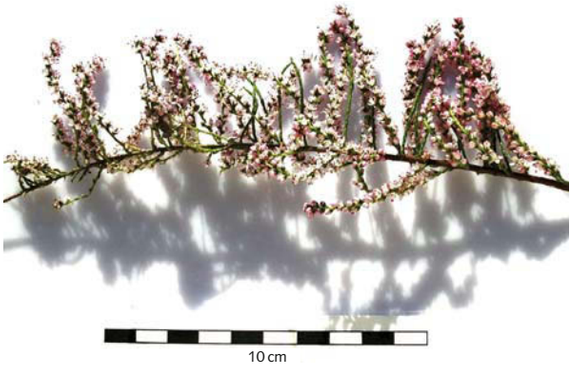


Fig. 13.91b: *Tamarix gallica* L.: blooming twig

Fig. 13.91c: *Tamarix gallica* L.: bark

Remarks:

a. *T. ramosissima* Ledeb. (syn.: *T. eversmannii* C. Prel. ex Bunge, *T. pallasii* auct., non Desv.), native to southern Russia, the Middle East, and central Asia, differs from *T. gallica* in the following traits: *young shoots* yellowish-green, quickly maturing to red-brown; *leaves* lanceolate, pale green; *petals* pale pink, to 1 mm long, persisting after blooming.

b. Above all *T. ramosissima* is highly competitive, due to its ability to tolerate water stress for extended periods of time; it can become a noxious weed (see GISD).

c. T. gallica contains the sweetener D-mannitol, a sugar alcohol.

Tepualia stipularis (Hook. et Arn.) Griseb
E: Tepu
Sp: Tepú, tepu, tepual, trepu
Fam. Myrtaceae

Fig. 13.92a: *Tepualia stipularis* (Hook. et Arn.) Griseb: shape [Chiloé]

Evergreen shrub or tree (in Chile), with a twisted *stem*, up to 12 m tall; *crown* broader than tall, irregular, strongly branched. *Bark* smooth, vine-red, flaking in patches. *Leaves* opposite, simple, 1 cm long, shortly stalked; *blade* hard, elliptic-lanceolate, with small translucent glands spread over its surface; *upper side* dark green, *underside* brighter, with a prominent central vein; *margin* entire. *Flowers* axillary, solitary or in groups of two, white; *calyx* of 5 sepals; *corolla* of 5 petals; *stamens* numerous. *Fruit* a capsule, 3–4 mm in diameter.– Fl. 2–3. Fr. 3–4 (?).

Status and distribution: Native; in Argentina: RN, CHU, SC, TF; in Chile: from Talca to the Strait of Magellan (Regions VII–XII).

Habitat: In Chile, especially along the Cordillera de la Costa, in the most wet areas, where it forms dense, boggy forests ("tepuales"). In Argentina, also in the most wet areas, but generally as shrubs. It associates with *Drimys winteri*, *Fitzroya cupressoides*, *Podocarpus* sp., *Saxegothaea conspicua*, *Pilgerodendron uviferum*.

Uses: Very hard wood, used as firewood.

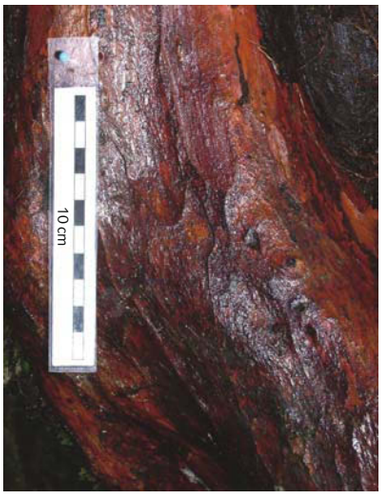


Fig. 13.92b: *Tepualia stipularis* (Hook. et Arn.) Griseb: bark

Fig. 13.92c: *Tepualia stipularis* (Hook. et Arn.) Griseb: twig

Characters	*Tilia platyphyllos*★)	*Tilia cordata*★)
Winter-buds	3 scales visible	2 scales visible
Leaf-blade	rounded, 6–12 cm across, *upper side* and underside light green; whitish hairs, especially in vein angles of underside	rounded, 3–7.5 cm across, *upper side* dark green, *underside* blue-green, with rusty hairs in vein angles
Leaf-stalk	hairy	hairless
Inflorescence	hanging, usually 3 flowers	erect, usually 5–10 flowers
Fruit	usually with 5 ribs	un-ribbed
Habitat	moist woods	on limestone
Hardiness	–28° C	–28° C
Origin	Europe, western Asia	Europe, Caucasus

★) *Tilia x vulgaris* has more or less intermediate traits.

Tilia L.

Fam. Tiliaceae

Deciduous trees, with a smooth or shallowly fissured *bark*. *Leaves* alternate, simple, with long petioles and stipules that fall off early; *blade* heart-shaped, asymmetric or truncate at base, *margin* serrate, *apex* acuminate to caudate. *Inflorescence* cymose, with a peduncle joined for half its length to a pale green bract. *Flowers* bisexual, yellowish-white, fragrant; *sepals* 5; *petals* 5; *stamens* numerous; *gynoecium* with a pentalocular, superior ovary. *Fruit* dry, indehiscent.– Fl. 12–1. Fr. 2–3.

The genus *Tilia* comprises about 30 species, native to the temperate zones of the Northern Hemisphere. In *Patagonia*, two species, and their hybrid are often planted for ornamental reasons.

Uses:

a. Wood: Soft, not very resistant wood, highly appreciated for wood carving and other decorative works, frames, wooden shoes, tabletops.

b. In medicine: The species belonging to the genus *Tilia* contain the flavonol fustin, which shows antibacterial properties and antiviral activity against Herpes simplex type I virus.– The infusion of the inflorescences has diaphoretic and sedative effects. TEM.

Fig. 13.93a: *Tilia platyphyllos* Scop.: shape

Tilia platyphyllos Scop.
Syn.: *Tilia officinarum* Crantz
E: Large-leaved lime, broad-leaved lime
Sp: Tilo de hojas grandes, tilo de Holanda, tilo común, tilo, tilero

Fig. 13.93b: *Tilia platyphyllos* Scop.: inflorescence

Fig. 13.93c: *Tilia platyphyllos* Scop.: leaves: underside and upper side

Tilia cordata Mill.
Syn.: *Tilia parvifolia* Ehrh. ex Hoffm.
E: Small-leaved lime
Sp: Tilo de hojas pequeñas, tilo de Europa, tilo, tilero, tejo blanco

Fig. 13.93d: *Tilia cordata*: inflorescence

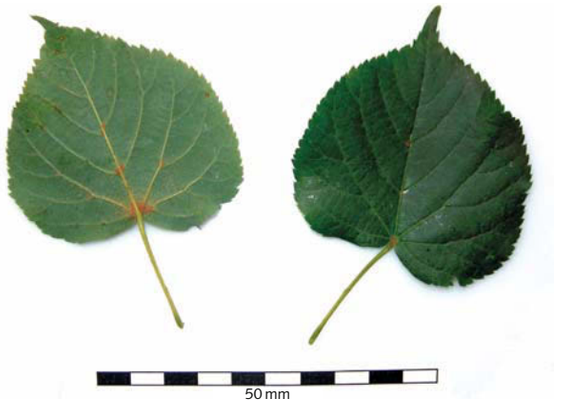


Fig. 13.93e: *Tilia cordata*: leaves

Tilia x vulgaris Hayne
Syn.: *Tilia x europaea* L.
E: Common lime
Sp: Tilo común; tilo europeo

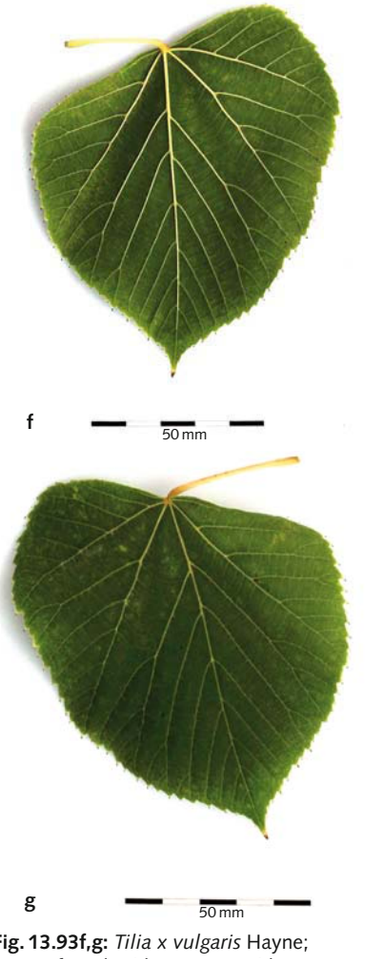


Fig. 13.93f,g: *Tilia x vulgaris* Hayne; leaves: **f:** underside; **g:** upper side

Tristerix corymbosus (L.) Kuijt
Syn.: *Lonicera corymbosa* L., *Loranthus tetrandus* Ruiz & Pav., *Phrygilanthus tetrandus* (Ruiz & Pav.) Eichler, *Tristerix tetrandus* (Ruiz & Pav.) Mart.
E: Mistletoe of Patagonia
Sp: Quintral, quitral, cutral, liga, muérdago cordillerano; cüchral, quinchral (in Mapuche)
Fam. Loranthaceae

Fig. 13.94a: *Tristerix corymbosus* (L.) Kuijt: inflorescence

Evergreen, hemiparasitic shrub, 1–2 m long, branched. *Leaves* opposite, simple, shortly stalked; *blade* ovate, 3–6 cm long, dark-green; *margin* entire. *Flowers* in terminal umbelliferous clusters of 10–20 units: red, pedicellate, 3.5–4.5 cm long; *tepals* 4 or 5; *stamens* 4 or 5. *Fruit* an ovate berry, 1 cm long, very sticky.

Status and distribution: Native; in Argentina: NE, RN; in Chile: in the central and southern regions.

Habitat: Quite frequent on *Azara microphylla*, *Maytenus boaria*, *Berberis buxifolia*, and other species.

Remark: This species damages the trees and shrubs on which it grows. It is used as an adstringent, and to dye black.

Uses in popular medicine: The fruits are edible and very sweet; they are traditionally used against diseases of the throat. TSAM.

Ulex europaeus L.
Syn.: *Ulex oposithotepis* Webb.
E: Gorse
Sp: Tojo, aliaga, toxo, argoma, escajo, arnio, toxo asnal, toxo gateño, ota
Fam. Fabaceae
††

Fig. 13.95a: *Ulex europaeus* L.: twig with flowers

Evergreen, very thorny shrub, up to 2 m tall; main *branches* erect or ascending, dark-green, furrowed, hirsute to tomentose; the younger parts densely branched, later becoming barren at base. *Leaves* alternate, 0.5–1 cm long, transformed into spiny phyllodes or reduced to scales. *Twigs*, borne in the axils of the phyllodes, 1.5–2.5 (3) cm long, strong, rigid, furrowed, and ending in a pungent spine. *Flowers* axillary, pea-like, fragrant, shortly stalked, with 2 bracteoles; *calyx* two-lipped, yellowish, hairy; *corolla* bright to golden yellow, standard 1.5–2 cm long, wings longer than keel. *Fruit* a legume, 1–2.5 cm long, densely hairy.– Fl. 9–10. Fr. 10–1.

Status and distribution: Introduced; native to Western Europe; usually on moderately acid soils. In Patagonia, a weed, above all in Western Patagonia (e.g. Chiloé). In Argentina, established in the provinces of BA, CHU, ER, RN. (See GISD.)

Remark: Branches and fruits contain the alkaloids anagyrine, cytisine and daidzein. Anagyrine and cytisine are highly toxic. Anagyrine is a cardiotonic agent and induces tachycardia. Daidzein has antifungal activity.

Fig. 13.95b: *Ulex europaeus* L.: thorns

Ulmus L.

Fam. Ulmaceae

Deciduous trees, up to 30 (40) m tall. *Bark* fissured. *Leaves* alternate, simple; *blade* asymmetrical at base (usually only slightly asymmetrical in *U. pumila*); *margin* coarsely-toothed; *stipules* early-falling. *Flowers* bisexual, appearing before the leaves (except in *U. parvifolia*) on the previous year's growth, wind-pollinated; *perianth-segments* connate; *anthers* purplish-red. *Fruit* a samara, winged all round, but emarginate at the apex.– Fl. 9–10. Fr. 10–12.

The genus *Ulmus* comprises about 26 species, native to the temperate and subtropical zones of the northern hemisphere. In Patagonia, several species are cultivated especially for ornamental reasons.

Uses: Fine wood used for cabinet making, furniture, veneers, coverings, piling.

Remarks: The taxonomy of *Ulmus* is not easy. The following table lists traits that enable to distinguish *U. minor* from *U. procera*.– In Patagonia, two other species of *Ulmus* can be found: *U. pumila* L. (Siberian elm), with elliptic to narrowly ovate, tapering leaves which often are nearly symmetrical at base and have double-toothed margins – and U. *parvifoli*a Jacquin (Chinese elm), which flowers in autumn, after the development of the leaves.

Characters	*U. minor*	*U. procera*
Young twigs	hairless or sparsely pubescent	persistently pubescent
Leaves	obovate to oblanceolate, 4–10 cm long, *upper side* usually smooth; the base of the long side making a 90° turn into the petiole	suborbicular to ovate, 5–8 cm long, *upper side* usually rough; the base of the long side rounded
Petiole	6–12 mm	4–6 mm
Origin	southern Europe, northern Africa, south-eastern Asia	origin of variety uncertain
Habitat	Mediterranean type of climate, well drained soils	
Hardiness	–20° C	–20° C

Ulmus minor Miller

Syn.: *Ulmus carpinifolia* Gleditsch., *Ulmus carpinifolia* Ruppius ex Suckow, *Ulmus campestris* auct., non L., *Ulmus diversifolia* Melville, *Ulmus foliacea* sensu Hayek, *Ulmus stricta* (Aiton) Lindley, *Ulmus glabra* Miller, non Hudson

E: Smooth-leaved elm

Sp: Olmo, olmo común, negrillo, álamo negro, olmo europeo

Fig. 13.96a: *Ulmus minor* Miller: twig with fruits

Fig. 13.96b: *Ulmus minor* Miller: twig

Fig. 13.96c: *Ulmus minor* Miller: bark

Ulmus procera Salisb.

Syn.: *Ulmus minor* var. *vulgaris* (Sol.) Richens

E: English elm

Sp: Olmo europeo, olmo negro

Fig. 13.96d: *Ulmus pumila* L.: shape [El Bolsón]

Fig. 13.96e: *Ulmus pumila* L.: twig

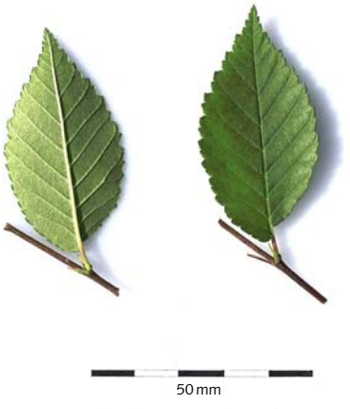


Fig. 13.96f: *Ulmus pumila* L.: leaves

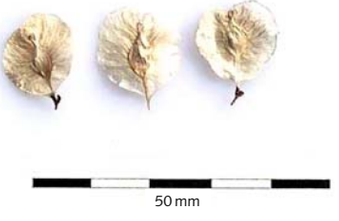


Fig. 13.96g: *Ulmus pumila* L.: fruits

Weinmannia trichosperma Cav.

Syn.: *Windmannia trichosperma* (Cav.) Kuntze

E: ?

Sp: Tineo, tenío, teñío, palo santo, teníu, teniú, tinel, madén

Fam. Cunoniaceae

Evergreen tree, up to 20 (30) m tall; *crown* sparse. *Bark* slightly wrinkled, greyish-brown. *Leaves* opposite, compound, stalked, 6–9 cm long and 2–4 across, with caducous stipules; *blade* odd-pinnate, composed of 5–9 pairs of opposite leaflets; *leaflets* oblanceolate, 1–2 cm long, *upper side* dark green, *underside* light green, *margin* serrate, *apex* acute; *rachis* with triangular opposite wings, giving it a rhomboidal appearance. *Flowers* borne in elongated, cylindrical racemes, 4–8 cm long: small, first white, changing to red, pedicillate; *sepals* 4–5; *petals* 4–5; *stamens* 8–10; *gynoecium* bicarpellate, bilocular. *Fruit* a reddish-brown, biapiculate capsule. Seeds tiny, with numerous fine hairs.– Fl. 11–12. Fr. 1–2.

Fig. 13.97a: *Weinmannia trichosperm*a Cav.: twig

Status and distribution: Native; in Argentina: CHU, NE, RN, SC; in Chile: from the Prov. of Linares to the Prov. Última Esperanza (Regions VII-XII).

Habitat: It grows on moist soils, in gorges, near rivers, lakes, even in marshes. It associates e.g. with *Aextoxicon*

punctatum, *Drimys winteri*, *Eucryphia cordifolia*, *Gevuina avellana*, *Laureliospis philippiana*, *Nothofagus dombeyi*.

Elevation: 0–1000 m

Uses: Reddish brown, darkly grained wood, hard, resistant, used in construction, for railway sleepers, poles, coverings. Species of outstanding ornamental value.

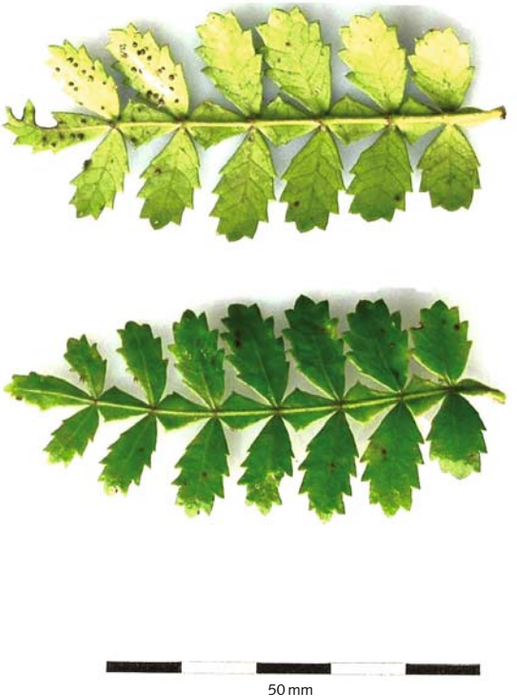


Fig. 13.97b: *Weinmannia trichosperm*a Cav.: leaves

Fig. 13.97c: *Weinmannia trichosperm*a Cav.: young twig

Fig. 13.97d: *Weinmannia trichosperm*a Cav.: bark

14. Genera and species of monocots

Chusquea culeou E. Desv.
Syn.: *Chusquea andina* Phil., *Chusquea argentina* Parodi
E: ?
Sp: Colihue, caña colihue, culeu, coligüe, itihue, caña brava, colíu (in Mapuche)
Fam.: Poaceae
†

Fig. 14.1a,b: *Chusquea culeou* E. Desv: **a:** shape in an open environment [PN Los Alerces]; **b:** shape within the forest [Puerto Blest]

Fig. 14.1c: *Chusquea culeou* E. Desv: twig

Culms, up to 7 m tall, simple, without ramifications. *Leaves* linear-elliptic, 2–10 cm long, briefly petiolate, with a membranous *ligule* and a rigid *apex*. *Flowers* grouped in dense panicles. *Fruit* a wrinkled caryopse.– Fl. 8. A *hapaxantic* species: the plant dies after having bloomed. Flowering occurs in intervals of several years.

Status and distribution: Native; in Argentina: CHU, NE, RN; in Chile: from the Prov. of Talca to the Prov. of Aisén (Regions VII–XI).

Habitat: It grows mainly on moist soils, belonging to the undergrowth of forests formed by *Nothofagus dombeyi, Fitzroya cupressoides, Lomatia ferruginea, Luma apiculata, Saxegothaea conspicua*, among other species.

Elevation: 800–1200 m.

Uses:

a. Wood: For construction, furniture, sticks, objects of craftsmanship, etc.

b. In popular medicine: The inflorescence is used as a contraceptive. The milky sap *(latex)* is poisonous and has been used against toothache. TSAM.

c. Other uses: Indigenous people used the culms to manufacture spears and the tube of the "trutrucas" (a sort of trumpet). The caryopses and the basal buds are edible.

Remark: Further species of the genus *Chusquea* can especially be found in Chile.

Fig. 14.1d: *Chusquea culeou* E. Desv: growing culm

Cordyline australis (G. Forst.) Endl.
E: Cabbage palm, cabbage tree
Sp: Cordiline, cordyline, dracena, cordiline de Nueva Zelandia
Fam.: Agavaceae

Fig. 14.2a: *Cordyline australis* (G. Forst.) Endl: shape [San Martín de los Andes]

Evergreen, mostly small tree, which can reach 12 (20) m of height, the stem widened at its base. With age, new stems tend to grow from the base. *Leaves* spirally, but forming clusters at the end of the branches, narrow, ribbon-like, 30–100 cm long and 3–6 across, acuminate, not pungent. *Flowers* creamy-white, in long panicles: 0.5–1.2 cm long, fragrant; *tepals* 6, connate, sub-equal; *stamens* 6; *ovary* trilocular, locules pluriovulate. *Fruit* a fleshy berry.

Status and distribution: Introduced; native to New Zealand. In *Patagonia,* ornamental, in protected places.

Hardiness: –12° C.

Remark: Cordyline is often not distinguished from certain species of *Yucca,* e.g. *Y. elephantipes* Regel, with keeled leaves towards the stingy apex and flowers of at least 2 cm length, the tepals only connate at their base.

Fig. 14.2d: *Yucca elephantipes* Regel: shape

Fig. 14.2b,c: *Cordyline australis* (G. Forst.) Endl: **b:** bark; **c:** leaves and flowers

Fig. 14.2e,f: *Yucca elephantipes* Regel: **e:** bark; **f:** bark and leaf

Jubaea chilensis (Molina) Baillon
E: Chilean palm
Sp: Palma chilena, palmera de coquitos, palma de miel, palma del vino de Chile, palmera de vino
Fam.: Arecaceae (Palmae)

Fig. 14.3a: *Jubaea chilensis* (Molina) Baillon: shape [Frutillar]

Evergreen, monoecious palm, up to 25 (30) m tall; *stems* solitary, massive, markedly swollen at or near the base and generally tapering towards the apex. *Crown* dense, almost spherical, formed by 40–50 leaves. *Bark* ash-grey, nearly smooth, covered with rhombic scars. *Leaves* pinnate, 2–4 m long and 50–60 cm across; *sheath* open, fibrous; *petiole* short, not really distinct from the sheaths; *blade* consisting of 110–120 linear-lanceolate, dark green to yellowish leaflets per side, more or less irregularly arranged along the rachis, but spreading in the same plane. The leaves are bent backwards, keeping the leaflets of each subsequent segment nearly in a horizontal plane. The leaves fall cleanly when dead, no rests persist on the stem. *Inflorescences* pendulous, up to 1.5 m long. *Flowers* unisexual, yellowish-red, borne in threes: of one central female and two lateral males. *Fruit* ovoid, yellowish, up to 5 cm long, resembling a small "coco-nut". Edible.– Fl. 9–11.

Status and distribution: Native, endemic to Chile. Formerly from Río Limarí to Curicó (Regions IV–VII). Now confined to a few small areas, principally in Ocoa and Cocalán.

Habitat: Foothills in dry valleys and hill slopes of the Coastal Cordillera, having a climate of Mediterranean type. In *Patagonia,* ornamental in more temperate areas, e.g. Valdivia and near Puerto Montt (Frutillar Bajo).

Hardiness: –10° C.

Uses: The "nut" (i.e. endocarp and seed) is used as snack food; "miel de palma" (palm honey) is extracted by tapping the stem. (Formerly, "palm wine" was made from the sap of cut trunks, a practice that has led to the demise of many populations of *J. chilensis.*)

Phoenix canariensis Hort. ex Chabaud
E: Canary Island palm
Sp: Palmera canaria, fénix
Fam.: Arecaceae

Fig. 14.4a,b: *Phoenix canariensis* Hort. ex Chabaud: **a:** shape [Neuquén]; **b:** spines at base of rachis

Evergreen, dioecious palm, with a single stout stem, covered with the remnants of the bases of old leaves. *Crown* dense. *Leaves* pinnate, 5–6 m long, stiff, with 150–200 pairs of leaflets, often arched in such a way that the leaflets stand in a vertical plane, pointing upwards and downwards, respectively; *proximal leaflets* transformed into short, strong spines. *Fruit* an ovoid, orange berry, 1.5–2.3 cm long.

Status and distribution: Introduced; native to the Canary Islands. In *Patagonia,* ornamental in comparatively temperate urban areas, e.g. Neuquén, Comodoro Rivadavia.

Trachycarpus fortunei (Hook.) H. Wendl
Syn.: *Chamaerops excelsus* Mart
E: Chusan palm, fan palm
Sp: Palmera de Fortune, palmito gigante, palma de jardín, palma molino de viento, traquicarpo de Fortune, palmera, palma china, chamerops, palma excelsa, palmito elevado
Fam.: Arecaceae

Fig. 14.5a,b: *Trachycarpus fortunei* (Hook.) H. Wendl: **a:** shape [Esquel]; **b:** Shape [El Bolsón]

Fig. 14.5c: *Trachycarpus fortunei* (Hook.) H. Wendl: male inflorescence

Evergreen, dioecious palm, with one or various stems, up to 12 (20) m tall. *Bark* densely covered with dark brown, fibrous remnants of old leaves. *Leaves* fan-shaped, rounded, up to 1.20 m across; *blade* completely divided into straight segments which are slightly curved towards their apices; *upper side* dark green, *underside* blue-green; the *tips* of the leaf-segments wither soon, turning yellowish. *Inflorescence* of pendulous panicles, densely packed with small, yellow, fragrant flowers. *Fruit* a rounded or kidney-shaped, blue-black berry, 1.2 cm across.

Status and distribution: Introduced, native to eastern and central China, where it grows on mountain slopes. In *Patagonia,* ornamental; *T. fortunei* is the palm that best withstands low temperatures.

Hardiness: –16° C.

Washingtonia filifera (Linden) H. Wendl
Syn.: *Pritchardia filifera* Linden
E: Washington palm, California palm, American cotton palm
Sp: Washingtonia, Californiana, palmera, palma, palmera Washingtonia, palma de Washington, washingtona
Fam.: Arecaceae

Fig. 14.6a: *Washingtonia filifera* (Linden) H. Wendl: leaf blade

Fig. 14.6b: *Washingtonia filifera* (Linden) H. Wendl: shape

Palm, up to 20 m tall; *stem* widened at base, strong and straight, up to 60 cm in diameter; in the upper parts, covered by the hanging rests of leaves. *Bark* greyish, comparatively smooth, with fine vertical fissures and narrowly ringed. *Leaves* palmate, about 2 m in diameter, with an up to 1.5 m long *petiole* having strong, tooth-like spines; *blade* palmatifid, cleft midway into 50–60 flexible, pendulous segments bearing greyish-green filaments or hairs. *Flowers* in hanging 3–5 m long inflorescences: white; *sepals* 3; *petals* 3; *stamens* 6. *Fruit* a blackish drupe, ovoid to ellipsoid, 0.6–1 cm across.

Status and distribution: Introduced, native to south-eastern California, western Arizona, and north-western Mexico. In *Patagonia,* ornamental in the more temperate regions (e.g. Neuquén).

Hardiness: –5° C

15. Afforestations with Pinaceae in zones of transition

A. Díaz (Esquel)*

15.1. Suitable areas for the afforestation

A long, narrow strip of land, adjoining the *Cordillera de los Andes* to the East and running north-to-south from latitude 37° S to 44° S within the scope of meridian 71° W encompasses the areas suitable for afforestation. Being about 750 km long and around 50 km wide, this zone of transition extends westwards to the regions of the Andean Patagonian forests, whereas eastwards it gradually merges with the Patagonian steppe. Its altitude above sea level varies between 200 m and 1000 m, and the annual rainfall fluctuates from 1200 mm (in the realm of the Andean Patagonian forests) to 400 mm (in the immediate vicinity of the Patagonian steppe itself).

Afforestation is usually not undertaken in areas with a pluviosity of less than 400 mm, although plantations showing a commercially relevant rate of growth have been reported for sites having an annual rainfall of just about 300 mm.

The entire region we are referring to for plantations with introduced species is completely void of forests;

Fig. 15.1: Afforestation with *Pinus ponderosa* in Esquel (Prov. Chubut, Argentina): young afforestation

rather, it comprises plains and shrubby tablelands which, proceeding eastwards, turn into deserts – and are now and then speckled with small patches of more moist or protected areas. The economic activities found in this region are incipient, farming is extensive, crops are on small scale, and there are neither any larger human settlements nor industrial complexes.

Fig. 15.2: Afforestation with *Pinus ponderosa* in Esquel (Prov. Chubut, Argentina): young plant

Concerning the *state of the soils* in the areas without forests, research work done on behalf of the INTA suggests that 18 % of the surface shows a light degree of desertification (with at least 50 % of the soil being covered by vegetation), whereas 60 % reveals a medium degree of desertification (with a coverage ranging from 50 % to 20 %), and 22 % of the soils suffer from a severe desertification (with more than 80 % of the soil surface being uncovered, i.e. naked).

The total surface of all the areas suitable for afforestation amounts to approximately 4 million hectares, of which – at present (2004) – roughly 90000 ha, i.e. less than 2.5 %, have undergone plantation. 70 % of these plantations are less than 15 years old, and about 80 % of them consist of only one species: *Pinus ponderosa*.

It has been verified that other species are also well adapted to the environmental conditions ruling the *zone of transition,* especially *Pinus contorta* and *Pseudotsuga menziesii*. Furthermore, experiences have been gained with *Pinus jeffreyi*. *P. monticola, P. pinaster, Picea* sp., *Abies* sp., and *Larix* sp. Regarding the angiosperms, i.e. *broadleaves,* we may mention the following genera: *Quercus* sp., *Juglans* sp. and *Betula* sp. for the wetter spots, *Ulmus* sp. and *Robinia* sp. for the dryer areas. Experiments are also being carried out with native species, e.g. *Nothofagus alpina, N. dombeyi, N. obliqua* – in more humid areas, and *Austrocedrus chilensis* and *Maytenus boaria* – in dryer areas.

* Text by A. Díaz, shortened, revised, and translated by B.G.

15.2. Justification of the activity

Forestry implies many activities that create a large quantity of *permanent jobs:* a high degree of diversification in the business sector, a network of freights and related services – all necessary to keep the system functioning, and an extensive range of craftsmanship in the elaboration of the final products. Besides, a vast amount of *part-time jobs* is created: The initial phase – comprising the cultivation of seedlings in the tree nursery and the bringing out of young plants on the fields – is restricted to the winter months. This winter-work is complementary to other seasonal employments, due to the low temperatures of the region that interrupt and adjourn work on the fields and in the construction industry. As the cycles of the plantations proceed and increase in number and size, the demand for workers rises: first for thinning out, later for the final clearing-cut.

A rough estimation reads as follows: For every 1000 afforested hectares, 100 persons are directly employed during 5 months; additionally, in the tree nurseries 10 permanent jobs are created, and 30 part-time jobs for 7 months.

Fig. 15.3: Afforestation with *Pinus ponderosa* in Esquel (Prov. Chubut, Argentina): plantation of middle age

Fig. 15.4: Afforestation with *Pinus ponderosa* in Esquel (Prov. Chubut, Argentina): afforestation after having been thinned out

From the *ecological point of view,* it is important to recognize the environmental benefits of the afforestation with introduced species when compared with the present-day farming activities on the soils of these zones of transition: The exploitation of these soils through sheep has led to an alarming desertification, whereas the afforestations help to diminish water erosion, as well as wind erosion – thereby slowing down the silting up of artificial lakes and irrigation channels, they also add to the landscape value, and they increase the fixation of carbon dioxide.

Several investigated plantations of *Pinus ponderosa* relish an annual rate of growth twice as high as in their countries of origin (USA, Mexico, Canada), a phenomenon that points to an enormous development potential in the entire zone of transition. If we extrapolate, it means that approximately 5000 persons would directly be employed within the entire cycle, transforming the forestry division into one of the most important economic factors of the whole region. At the same time, the eroded soil would regenerate, covering itself with forests that exhale a strong scent of resin.

16. Fruit trees in Los Antiguos and Chile Chico – Lake Buenos Aires / General Carrera

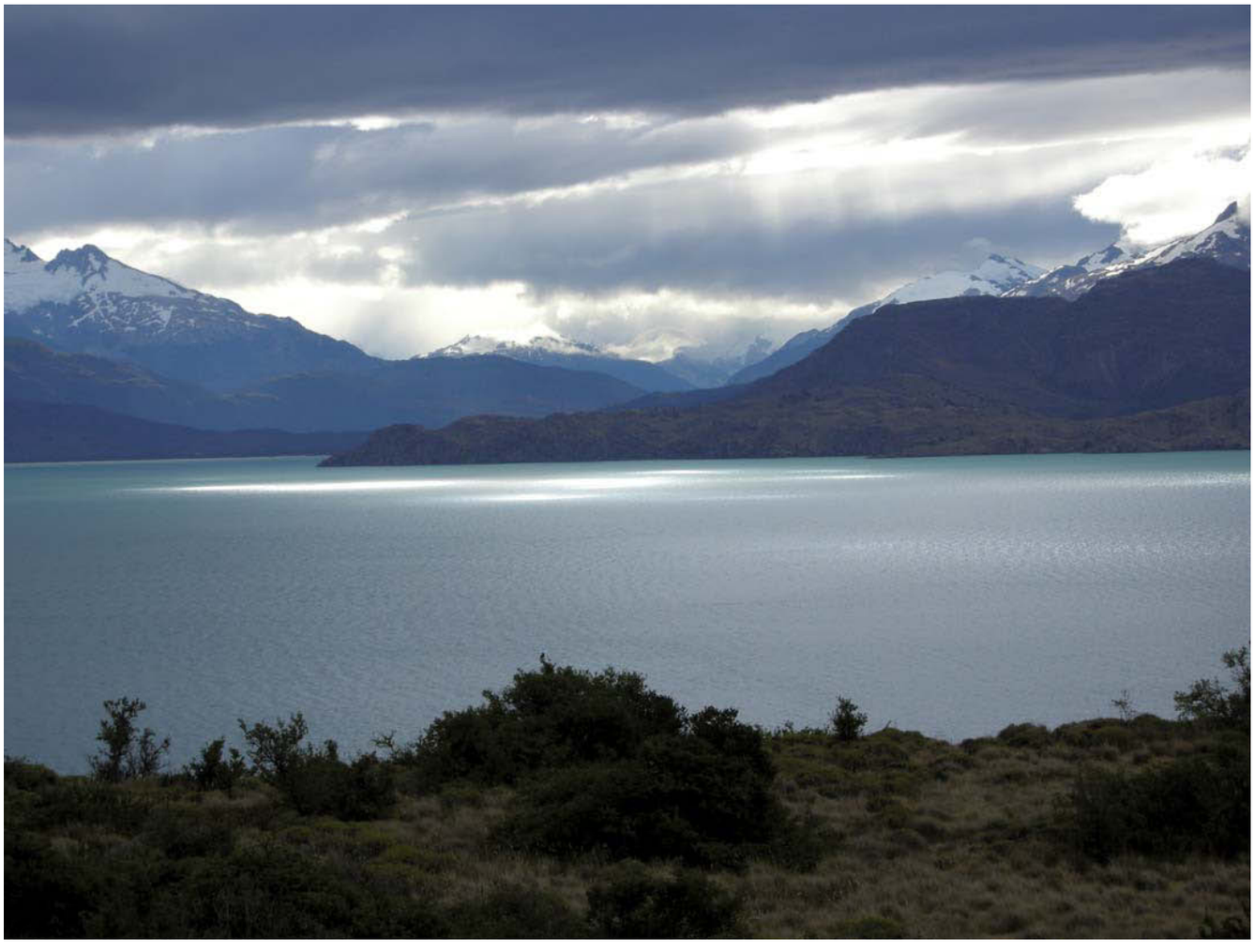


Fig. 16.0: Lago General Carrera, near Puerto Guadal. (01.02.08, late afternoon)

Guido Vittone (Los Antiguos)

Lake Buenos Aires – in Chile called *Lago General Carrera* – is situated at 46° 30' latitude south, at an altitude of 205 metres above sea level. Its approximate surface area of 2240 sq. km makes it the largest body of fresh water in Patagonia, having a maximum depth of 590 m. The western end of the lake is close to a vast glacier or ice-field, known as the *Campo de Hielo Norte,* from which most of the melt water entering the lake derives. The eastern sector of the lake, coinciding roughly with the portion of the lake on the Argentine side, features the widest section (approximately 22 km), in an area of semi-arid steppes that benefits climatically from the proximity of the lake.

Lago Buenos Aires drains into the Pacific Ocean through Río Baker, no other of Chile's rivers having an equally big discharge. During the Pleistocene glaciations, this outlet in the heart of the Andes was blocked, forcing the lake to drain eastwards into the Atlantic Ocean along the Deseado valley. In those times, the level of the lake must have been over 200 vertical metres higher than it is at present.

There is evidence that human presence in the region can be traced back nearly 10,000 years, although occupation probably was sporadic, in the light of climatic changes and frequent volcanic eruptions in the adjoining

Fig. 16.1: Scenery of Los Antiguos (46° 33 S; 71° 37 W), with "chacras" and wind-barriers of *Populus pyramidalis;* in the first plain, plantations of *Prunus avium;* in the second plain, plantations of *Fragaria* sp.; in the background, Lake Buenos Aires

area to the northwest. During the nineteenth century, the small aboriginal groups, who had fully adopted the use of the horse, seem to have concentrated their activities in areas located farther away from the lake; this latter region seems to have been visited only marginally, if at all.

Only from 1910 onwards did the first permanent settlers arrive at the southern shore of the lake, on both sides of the river Jeinimeni, which had been chosen a few years earlier as the natural borderline between the two countries. The region can therefore claim to be one of the last to be colonised in the entire Patagonia, being the meeting place of waves of settlers, coming from the north and the south.

The climate at the delta of the rivers Jeinimeni and Los Antiguos is temperate and semi-arid. Summer days are long, with high solar radiation and low relative humidity. The annual amount of precipitation is around 250 mm, seasonally concentrated during the autumn and winter months, in form of rain and, to a much smaller degree, as snow. Very strong winds from the West and Northwest are very common during springtime. The monthly mean temperature for July is 2.7 C°, and that of January 14.9 C°. Extreme minimum and maximum temperatures may reach –12 C° and 32 C°, respectively. January is considered to be a frost-free period, occasionally including December and/or February as well.

From the shore of the lake southwards, the landscape exhibits moraines and terraces of fluvio-glacial origin, gradually ascending towards basaltic plateaux. These areas, more characteristic of the Argentine side, display only *Schinus patagonica,* a species much used as firewood during the first decades of the 20th century, and *Discaria trinervis,* a species growing only close to springs and streams. West of the river Jeinimeni, a more mountainous terrain and higher ranges of precipitation sustain *Nothofagus antarctica* and *Nothofagus pumilio.*

Human presence, as in the entire Patagonia, is signalled by the introduction of *Populus nigra* var. *pyramidalis*, well adapted to virtually all southern environments with water availability, and used chiefly as wind-barrier. The poplar, truly a Patagonian landmark, is seconded by the genus *Salix,* with many of its species. To a much lesser degree, *Sambucus nigra* is also found, together with the ornamental species and the fruit trees to be described.

Farms nestled in the more sheltered areas close to the lake became small scale producers of alfalfa in order to supply with fodder the neighbouring "estancias", as sheep stations are known locally. Within the small farms, or "chacras", vegetables and sometimes cereals were also grown, while small orchards of *Malus domestica, Pyrus comunis, Prunus armeniaca, Prunus avium, Prunus cerasus, Prunus persica,* and *Cydonia vulgaris* proved successful in the earlier years.

From the early 1960s a State Forestry Department started to carry out experimental plantations of Pinaceae, Cupressaceae, and Taxodiaceae in the small town of Los Antiguos. *Larix decidua., Picea abies, Pinus contorta, Pinus halepensis*, *Pinus pinea*, *Pinus ponderosa*, *Pinus radiata*, *Pseudotsuga menziesii*, *Sequoiadendron giganteum*, *Cedrus deodara*, and *Juniperus communis* stand out among the species introduced.

The regional economy, highly dependant on the production of wool, declined in the late 1960s. Visitors to the area at that time were impressed by the size of old cherry trees loaded with fruit. The variety and origin of those specimens was unknown, but encouraged people to start plantations of *Prunus avium* in Los Antiguos. The first plants were brought from the Rio Negro valley and the results were encouraging. The initial plantations were enlarged. The introduction of *Cupressus macrocarpa* brought from Mar del Plata as wind-barriers also proved successful, adapting well to rocky soils and dry summers.

Improvements in road infrastructure to the Atlantic coast in the late 1980s positively influenced the development of the region. Cherry production – encompassing an area of nearly 200 hectares – became one of the pillars of the local economy. However, the area experienced a setback with the effects of the eruption of Volcán Hudson, located about 150 km to the northwest. During the month of August 1991, volcanic ash carried by the wind deposited over a large swathe of land, covering the area around the lake in layers several centimetres thick. Fortunately, the typical strong winds took few years to clear the land almost completely, and what was incorporated into the ground actually improved certain soil characteristics and fostered a quick recovery.

Tourism is currently aiding the further development of the region. A visitor will find the streets and gardens of Los Antiguos and Chile Chico tidily ornamented with *Betula pendula, Robinia pseudoacacia, Tilia* sp., and *Fraxinus* sp., among other genera and species.

17. Trees in urban landscapes

Bernardo Gut (Basel)*

17.1. A glance back in time

Human settlements have always implied a drawback for the natural state of the environment. But in the course of replacing forests, meadows, marshes by buildings, streets, marketplaces, men also developed a strong desire to incorporate natural elements into urban design: The early Egyptians, e.g., planted trees in regular symmetrical rows along their temple avenues and in their gardens; the Assyrians created geometrically designed parks within the boundaries of their cities in 700 BC; the Arabs developed exquisite gardens in Andalusia and Sicily that were maintained, copied and modified by those who overthrew them.

In Western Europe, all these approaches to work with natural elements as components of urban landscapes *in a wider sense* gave rise to a complex, richly interwoven set of ideas to which we refer when using such terms as 'monastery gardens', 'Renaissance garden', 'Italian villas', 'Baroque parks', 'English landscape gardens', etc.

Regarding urban design *in a narrower sense,* however, it was first in 17th century Paris that the use of trees became essential, beginning with the *Cours de Vincennes,* an alley of *Ulmus* set up by Henry IV (1589–1610) (D. Hennebo, p. 105). Without the artfully planted and well kept trees uniting avenues and parks, the Tuilleries, the Champs Elysées and the entire network of avenues would lose their charm and splendour, and the fine formal design could only be grasped intellectually, ceasing to be the appealing experience we enjoy.

The new approach to include trees in urban design spread almost immediately to other European cities: In Berlin, e.g., the avenue *Unter den Linden,* which extends over approximately one kilometre, was lined with *Juglans* and *Tilia* as early as 1647. In Amsterdam, as a relief map of 1663 shows, canals were lined with trees, and rows of trees were planted near the main churches. (C.C. Konijnendijk, p. 39). In short, from the 17th century onwards, the design of urban landscape with the inclusion of plantations of various kinds has received a constantly increasing attention, and has thus evolved rapidly.

17.2. A benevolent look at Patagonian settlements

Citizens of the Patagonian towns and the few larger cities – on both sides of the *Cordillera* – may only look back at a short history of their settlements (comprising, in most cases, less than 150 years). These were either founded by colonists as their villages or by the military, as a kind of garrison towns, or in a combination of both intentions. In general, a more or less rectilinear geometric plan served as template. The colonists were vitally interested in making their living, before devoting much attention to the necessity of creating an agreeable urban environment. And it was certainly not of first priority for the local political authorities to strive for a tree-based urban design.

However, the settlers from nearly all over the world soon began to plant trees of all kinds of species, many of them from their countries of origin. Gradually, the authorities of the larger towns envisaged here and there the creation of a park, and they set about planting trees along the main axes and important streets of the towns. The citizens themselves indulged very early in adorning their *fore gardens* with one or two trees and they started to select tree species for the pavement in front of their houses.

Unfortunately, in most Patagonian settlements the utility lines are over-ground, with all the wires running through the crowns of the trees. This has led, in many places, to hideous, insensible cuttings, with severe consequences for the implied trees and a devastating impact on the aesthetics of the urban environment. To my knowledge, there are, in Chilean as well as in Argentine Patagonia, hardly any larger towns that can provide an accessible inventory of all their urban tree species, let alone present systematically elaborated plans for improving the designs, variations, and the care of plantations of urban trees.

Nevertheless, private initiative and, in certain towns, keen interest and dedication of members of the local authorities to improve the urban environment have contributed to assemble a remarkable diversity of species, which in a small number of regions – as El Bolsón–Esquel – is comparable to the inventory of such a venerable old city as Basel (47° 38'N), with a long tradition indulging in the care of the urban landscape.

Given the fact that Patagonian towns are located in very different climatic regions, it is clear that the list of species that follows cannot be applied to all towns. Regarding the *Chilean* side, the exceptionally fine climatic conditions for tree-development reigning from Valdivia to the south of Chiloe allow for an almost indefinite number of urban tree species to be planted, what, of course, has

* After a draft by M.P. Guzzetti (Buenos Aires)

not occurred. On the *Argentine* side, we find such favourable conditions above all in the area of El Bolsón – Lago Puelo, where "Mediterranean" species as *Laurus nobilis, Ficus carica, Juglans regia, Acacia dealbata, Eucalyptus* sp., *Araucaria angustifolia, Cordyline australis* grow almost side to side of the "alpine" *Pinus cembra*. Extraordinary, also, is the diversity of species being cultivated in certain cities, e.g. Neuquén and Trelew. In this latter town, the legal foundation established by the ordenanza 04195 of September 15th, 1992, and the work carried out by the Dirección de Espacios Verdes has led to a well kept, outstanding urban green space. The accomplishments arrived at in Trelew deserve to be studied in detail by authorities and citizens of other Patagonian settlements.

Within the realm of our book, there is neither room for comments nor for detailed recommendations. However, I strongly suggest that the theme of "trees in urban landscape" should receive due attention from the local authorities and associations of citizens. "Urbanity" is synonym to *open-mindedness*, and this is particularly important when working with trees in urban design. It would be a sad loss of possibilities if certain species were discarded, simply on grounds of their "exotic" origin. If we consider the list of species I have come across in urban realms (see **17.3**) and add to it other species reported for Patagonia by Dimitri (1982)* or being successfully grown in northern Europe** (see **17.4**), we have an impressive amount of species to work with, always taking care of the various local conditions. Thriving to improve and to embellish the urban landscape in a rational and endurable way is doubtlessly a deeply rewarding task. Excellent literature on all these themes is available (cf. A. Bradshaw et al. (1995); H. Balder et al. (1997); E.F. Gilman (1997); W. Gaida and H. Grothe (2000); P.J. Trowbridge and N.L. Bassuk (2004); C.C. Konijnendijk et al. (2005)), and professional aid certainly at hand.

17.3. Species of the urban landscapes of Patagonia

17.3.1. Usually tree-like shape

Abies sp.
Acacia dealbata Link
Acacia melanoxylon R.Br.
Acer campestre L.
Acer negundo L.
Acer platanoides L.
Acer pseudoplatanus L.
Aesculus hippocastanum L.
Ailanthus altissima (Mill.) Swingle
Albizia julibrissin Durazz.
Alnus glutinosa (L.) Gaertn.
Alnus incana (L.) Moench.
Araucaria angustifolia (Bert.) Kuntze
Araucaria araucana (Mol.) K. Koch
Betula papyrifera Marshall
Betula pendula Roth.
Betula pubescens Ehrh.
Calocedrus decurrens (Torrey) Florin
Castanea sativa Miller
Casuarina equisetifolia J. R. et G. Forster.
Catalpa bignonioides Walter
Catalpa speciosa (Warder ex Barney) Engelmann
Cedrus atlantica Manetti
Cedrus deodara G. Don
Cercis siliquastrum L.
Chamaecyparis lawsoniana (Murray) Parlatore
Chamaecyparis nootkatensis (D. Don) Spach
Chamaecyparis obtusa (Sieb. et Zucc.) Endl.
Cordyline australis (G. Forst.) Endl.
Crataegus monogyna Jacquin
Crataegus laciniata Ucria
Crataegus laevigata (Poiret) DC.
Crataegus x Lavallei Herincq ex Lavallée
Cryptomeria japonica (Thunberg ex Linnaeus f.) D. Don
Cupressus arizonica Greene
Cupressus lusitanica Miller
Cupressus macrocarpa Hartweg ex Gordon
Cupressus sempervirens L.
Cydonia oblonga Mill.
Drimys winteri J.R. Forster et G. Forster
Embothrium coccineum J.R. Forster et G. Forster
Erythrina crista-galli L.
Eucalyptus camaldulensis Dehnh.
Eucalyptus cinerea F.J. Muell. ex Benth.
Eucalyptus coccifera Hook. f.
Eucalyptus dalrympleana Maiden
Eucalyptus globulus Labill.
Eucalyptus gunnii Hook. f.
Eucalyptus viminalis Labill.

Eucryphia cordifolia Cav.
Fagus sylvatica L.
Ficus carica L.
Fraxinus excelsior L.
Fraxinus pennsylvanica Marshall
Ginkgo biloba L.
Gleditsia triacanthos L.
Ilex aquifolium L.
Jubaea chilensis (Mol.) Baillon
Juglans regia L.
Lagerstroemia indica L.
Larix decidua Mill.
Laurus nobilis L.
Ligustrum lucidum Aiton
Liriodendron tulipifera L.
Luma apiculata (DC.) Burret
Magnolia grandiflora L.
Malus sp.
Maytenus boaria Mol.
Maytenus magellanica (Lam.) Hook.f.
Melia azedarach L.
Metasequoia glyptostroboides Miki ex Hu et Cheng
Nicotiana glauca Graham
Nothofagus alpina (Poepp. et Endl.) Oersted
Nothofagus antarctica (G. Foerster) Oersted
Nothofagus dombeyi (Mirbel) Oersted
Nothofagus nitida (Phil.) Krasser
Nothofagus obliqua (Mirbel) Oersted
Nothofagus pumilio (Poeppig et Endl.) Krasser
Olea europaea L.
Parrotia persica (DC.) C.A. Meyer
Phellodendron amurense Ruprecht
Phoenix canariensis Chabaud
Photinia serratifolia (Desf.) Kalkman
Picea abies (L.) Karsten
Picea glauca (Moench) Voss
Picea pungens Engelm.
Pinus banksiana Lamb.
Pinus cembra L.
Pinus contorta Douglas ex Loudon
Pinus halepensis Mill.
Pinus jeffreyi Grev. et Balf.
Pinus lambertiana Dougl.
Pinus monticola Douglas ex Don
Pinus mugo Turra
Pinus pinaster Aiton
Pinus pinea L.
Pinus ponderosa Douglas ex Lawson & C. Lawson
Pinus radiata D. Don
Pinus strobus L.
Pinus sylvestris L.
Platanus x *hispanica* Mill. ex Muenchh.
Populus alba L.
Populus nigra L.
Populus nigra var. *pyramidalis* Spach
Populus tremula L.
Populus trichocarpa Torrey et A. Grey ex Hooker
Populus x euramericana (Dode) Guinier
Prunus avium L.
Prunus cerasifera Erh. var. *pissardii* (Carrière) Bailey
Prunus laurocerasus L.
Prunus persica (L.) Batsch
Pseudotsuga menziesii (Mirb.) Franco
Quercus palustris Münchhausen
Quercus robur L.
Quercus rubra L.
Quercus suber L.
Robinia pseudoacacia L.
Salix alba L.
Salix babylonica L.
Salix caprea L.
Salix fragilis. L.
Salix humboldtiana Willd.
Salix viminalis L.
Salix x *erytroflexuosa* Rag. et R. Alb.
Sambucus nigra L.
Schinus patagonica (Phil.) I.M. Johnst.
Sequoiadendron giganteum (Lindl.) Buchholz
Sophora japonica L.
Sorbus americana Marshall
Sorbus aria (L.) Crantz
Sorbus aucuparia L.
Taxus baccata L.
Thuja occidentalis L.
Thuja orientalis L.
Thuja plicata D. Don
Tilia cordata Mill.
Tilia platyphyllos Scop.
Trachycarpus fortunei (Hook.) H. Wendl
Ulmus minor Miller
Ulmus minor var. *vulgaris* (Sol.) Richens = *U. procera* Salisb.
Washingtonia filifera (Linden) H. Wendl.

17.3.2. Usually shrub-like shape

Buddleja davidii Franch.
Buddleja globosa Hope
Cotoneaster sp.
Crataegus monogyna Jacquin
Crataegus laevigata (Poiret) DC
Cytisus scoparius (L.) Link
Elaeagnus angustifolia L.
Euonymus sp.
Juniperus communis L.
Juniperus virginiana L.
Laburnum anagyroides Medikus
Philadelphus sp.
Syringa vulgaris L.
Tamarix gallica L.
Tamarix ramosissima Ledeb.
Viburnum sp.

17.4. Further species for urban areas in Patagonia

The following species are either reported for Patagonia by Dimitri (1982)★ or are grown successfully in northern Europe★★ under environmental conditions comparable to those reigning in many areas of Patagonia.

Abies amabilis Dougl. ex J. Forbes★
Abies balsamea (L.) Mill.★
Abies concolor (Gordon et Glend.) Lindl. ex Hildebr.★
Abies grandis (D. Don) Lindl.★
Abies lasiocarpa (Hook.) Nutt.★
Abies magnifica A. Murr.★
Abies nordmanniana (Stev.) Spach★
Abies numidica De Lannoy ex Carr.★
Abies procera Rehder★
Abies sibirica Ledeb.★; ★★
Abies veitchii Lindl.★★
Alnus rubra Bong.★
Betula populifolia Marsh.★
Cercidiphyllum japonicum Siebold et Zucc.★★
Corylus colurna L.★★
Davidia involucrata Baillon★★
Eucalyptus pauciflora Sieber ex Spreng.★
Eucalyptus stellulata Sieber ex D.C.★
Juglans mandschurica Maxim.★★
Juniperus chinensis L.★
Larix leptolepis (Sieb. et Zucc.) Gord.★ = *L. kaempferi* (Lamb.) Carrière
Larix sibirica Ledeb.★★
Picea engelmannii Parry ex Engelm.★
Picea jezoensis var. *hondoensis* (Sieb. et Zucc.) Carrière★
Picea mariana (Mill.) Britton, Sterns et Pogg.★
Picea maximowiczii Hort. Petrop. ex Tegel★
Picea omorika (Pančić) Purk.★
Picea rubens Sarg.★
Picea sitchensis (Bong.) Carrière★
Picea smithiana (Wall.) Boissier★
Pinus banksiana Lamb.★
Pinus bungeana Zucc. ex Endl.★
Pinus canariensis C. Smith★
Pinus densiflora Sieb. et Zucc.★
Pinus flexilis James★
Pinus gerardiana Wall. ex G. Don★
Pinus griffithii McClelland★ = *P. wallichiana* A.B. Jacks.
Pinus nigra Arn.★
Pinus pungens Lamb.★
Pinus rigida Mill.★
Pinus sabiniana Dougl.★
Pinus thunbergii Parl.★
Populus simonii Carrière★★
Prunus maackii Rupr.★★
Pterocarya fraxinifolia (Poiret) Spach★★
Sorbus decora (Sarg.) C.K. Schneid.★★
Tsuga canadensis (L.) Carr.★

18. National parks, forest reserves, and regional reserves of Southern Argentina and Chile

Fig. 18.0: Lago Verde, PN Los Alerces. Mainly *Austrocedrus chilensis,* on the north-exposed areas (left), and *Nothofagus dombeyi*, on the south-exposed slopes (right). (29.01.08, afternoon)

18.1. Argentina

by Maurice Rumboll

18.1.1. Introduction

As stated in chapter **3**, Argentine Patagonia covers the region between the Río Colorado and Tierra del Fuego, an area that includes *three major habitats*:

(i) To the *west* is what is often referred to as the "Switzerland of South America" – forested mountains and lakes, all beautifully landscaped as a result of glaciations during the most recent ice-age that ended only ten to twelve thousand years ago. About one third of these Sub-Antarctic Woods comes under some manner of conservation. There are eight national parks within this biome.

(ii) To the *east* of this strip and in the rain shadow of the mountains lie the steppes, a series of descending plateaux dominated by scrub vegetation, with few rivers in grassy valleys draining to the Atlantic. This is the land of sheep farms of enormous size, where the impact of grazing has led to severe erosion in many places.

(iii) Finally, there is the *coastal* fringe, where the slightly higher ambient humidity supports a greater diversity of vegetation, allowing a relatively good grazing.

In the area comprised between the western limit of the steppe and the coastline (i.e. in (ii) and (iii)), there are only three national parks, one of which encompasses both steppe and coast.

18.1.2. History and General Features

In Argentina, the conservation of natural areas was pioneered by Francisco P. Moreno (*1852 – †1919) who explored much of the southern Andes in the second half of the 19th century. Having acted as Argentine representative on the border commission, Moreno was rewarded for his efforts in establishing the international line between Chile and Argentina by being given three square leagues (7500 hectares) of land at his choice. He selected the area of Puerto Blest (40 kilometres west of S. C. de Bariloche) and promptly gave it back to the Nation, under the conditions that "it be conserved as a natural park for the public" and that "the surrounding area be not modified, and that there should be no more development than absolutely necessary for the comfort of the cultured visitor." His letter to the government of General Roca was dated 6th November (1903) – now Argentine National Parks Day –, and it made Argentina the third nation to have such parks, after USA and Canada, but it took over thirty years to set up the law and administration responsible for these nationally protected areas. Provisionally, in 1907, some 43,000 hectares were declared a public park, although the Servicio Nacional de Parques y Turismo, (today APN [Administration de Parques Nacionales], the National Parks Service) only came into being in 1934. For decades thereafter, the criteria for areas to be included in the system was based on proximity to the frontiers and scenic beauty or spectacular landscape features, so the mountains, lakes and woods of Andean Patagonia were given priority, and in a few years there was a string of national parks all down the region.

Other protected areas exist under such legal frameworks as private reserves or as several categories of provincial reserves. It is to be lamented, however, that especially in the latter many are mere "paper" parks and reserves with no *in situ* custodians, no management plan, no budget – all told, little effective interest on the part of the provincial governments that are usually short on funds, and have other priorities. Nevertheless, with the growth of international tourism, this is changing somewhat and the shortcoming may be corrected in the not-too-distant future.

18.1.3. The Western Patagonian (Andean) National Parks

By the time APN was set up, there was already land in private ownership in the areas destined to be declared national parks, and these properties became reserves around the national parks proper, as buffer zones. The land owners had brought in many species of plants and animals from the northern hemisphere. Around their properties, the native woods and forests grew and were protected from lumbering, fires, clearance, cattle grazing and other such detrimental practices. On the other hand, and regrettably, from these homesteads several of the introduced species began to spread, with several of them becoming problematical.

The native woods are dominated by three species of *Nothofagus* (Southern Beeches), a genus shared with New Zealand and Australia. They cloak the whole of the region from the steppe – where *N. antarctica* (Antarctic Beech) grows in the damper situations –, through pure woods of *N. dombeyi* (Evergreen Southern Beech, Coigüe) in the mountain valleys and lower slopes, to *N. pumilio* (Lenga) on the upper slopes; at tree-line this species grows as stunted, ground-hugging specimens. *N. pumilio* and *N. antarctica* are deciduous and offer a lovely spectacle with autumn golds and reds. Whilst these species are dominant all the way to the south, *N. dombeyi* is replaced by *N. betuloides* (Guindo) as from about 47° S. In smallish areas of the woods, grow patches of other species: *Luma apiculata* (Orange-Barked Myrtle), *Araucaria araucana* (Monkey Puzzle), *N. alpina* (Rauli), and *N. obliqua* (Roble Beech), to name but the more common ones.

There are places in the western fringe where the very high rainfall of the Pacific slope reaches sheltered valleys. Such is the case at Puerto Blest, where the true Valdivian forests grow. The number of species is much greater there and the emblematic tree is *Fitzroya cupressoides* (Patagonian cypress). *Maytenus boaria* (Maiten) is limited to an area between the *N. antarctica* and the *N. dombeyi*, the eastern edge of the woods, as is *Austrocedrus chilensis* (Chilean Cedar). *Lomatia hirsuta* (Radal), a proteaceous tree, and the brilliant red-flowering *Embothrium coccineum* (Chilean Firebush) also tend to the eastern, drier reaches.

As already mentioned, some introduced species have become invasive. Such is the case of *Pseudotsuga menziesii* (Douglas Fir) and some lesser species as *Rosa rubiginosa* (Sweet Brier), *Cytisus scoparius* (Broom), *Lupinus* sp. (Lupins), *Digitalis* sp. (Fox-gloves) amongst others. In places, there are efforts for their eradication, but with limited success.

In the case of animals, the introduction of the Red Deer to neighbouring areas of the parks and their subsequent spread into the protected areas has led in part to the reduction of the populations of Andean Deer (*Hip-*

pocamelus bisulcus) and the miniscule Pudu (*Pudu pudu*), the world's smallest deer, to the point of being seriously threatened, but effective restoration of the populations is being undertaken in certain areas of both countries.

With the passage of the National Parks law, what is today **Nahuel Huapi National Park** was set up around that first nucleus of land donated by Moreno. With its 710,000 hectares stretching from the western border in the heart of the mountains out onto the steppes in the foothills and rolling plains, this is still the most popular park for visitors. In the tucked-away corner that Moreno chose, the wettest Valdivian cool forest grows with many species from "over the top" in Chile. They are all tied up with vines and lianas, thick undergrowth of canes and *Berberis,* gigantic-leaved *Gunnera chilensis* growing on steep banks. It fell to the Parks Administration to design and create the town of Bariloche (41° S), erecting all the public buildings and services for receiving tourists.

In 1937, several Patagonian Andes parks were added – **Lanín National Park** borders Nahuel Huapi to the north and harbours three species of trees not found in Nahuel Huapi: *Nothofagus alpina* (Rauli), *N. obliqua* (Roble Beech), and *Araucaria araucana* (Monkey Puzzle). Both the beech species are protected, though in parts of the reserve they are harvested rationally to supply the lumber trade as there are no other places outside the park where they still exist. The *Araucarias* are almost trees of the steppe and grow in monospecific woods to the east.

To counter the pressures for returning jurisdiction to the Province of Neuquén, the Quetrihue Peninsula which juts into Nahuel Huapi lake from Villa Angostura (40°45'S), was declared a park on its own merits **(Los Arrayanes National Park),** the chief attraction being the stand of pure *Luma apiculata* (Orange-Barked Myrtle = Arrayán) woods at the southern tip. Another important feature of the small thousand hectare park is its remnant population of Southern Otters (*Lutra provocax*), the last remaining viable population of a species that virtually disappeared with the introduction of trout that compete for its food and are, incidentally, too swift for the otter to take. Los Arrayanes National Park is administered by Nahuel Huapi which surrounds it on all sides.

The small town of El Bolson is the jumping off point for **Lago Puelo National Park** (42° S) which has the peculiarity of a low elevation (200 metres above sea-level) and therefore has a much more temperate climate. The watershed drains directly west, into the Pacific through Chile, which gives access to a number of species that are common on the Chilean slope but are only found in Puelo in Argentina. It is the smallest of the South Andean parks (except Arrayanes) and there grow such specials as *Gevuina avellana* (Avellano patagónico), *Aextoxicon punctatum* (Tique), *Eucryphia cordifolia* (Ulmo), *Boquila trifoliolata* (Voqui) and *Coriaria ruscifolia* (Deu) and imposing stands of *Myrceugenia exsucca* (Petra or Patagua), though this last is not exclusive to the park.

Esquel (43° S) is the nearest town to **Los Alerces National Park** (263,000 hectares). The park got its name from the wondrous forests of "Alerces" *(Fitzroya cupressoides,* Patagonian Cypress), but its dominant species is *Nothofagus dombeyi* (Coigüe). To visit the area where the *Fitzroya* grows, it is necessary to take the launch excursion; there are specimens dated at over 3000, or perhaps 4000 years of age and 70 metres tall. At the eastern entrance of the park are the best stands of one of the most lovely trees, *Maytenus boaria* (Maiten).

Francisco P. Moreno National Park (115,000 hectares, 48° S) is remote and unique in having a large area of high altitude grassy steppe; it is one of the very few areas where introduced trout have not invaded the series of glacial lakes draining west and these are therefore stocked with the original interesting though non-sporting fish fauna, naturally protected. In these latitudes the winds are fierce westerlies ("Roaring Forties") and stunting does not correspond to elevation as much as to exposure to the west winds – in certain places each tree growing further east is a little taller in the slight shelter until huge specimens grow on the eastern edge. Forest fires, set on purpose before this became a park, have destroyed much of the woods up against the steppe. Sheep and cattle did the rest by inhibiting re-growth. Now no domestic animals graze there. F. P. Moreno National Park is for hiking and riding – very little of it is accessible in cars.

The **Los Glaciares National Park** is spectacular with its glaciers descending from the South Patagonian icecap (the largest after Antarctica and Greenland) that drop into the lakes. The Moreno glacier ploughs across an arm of Lago Argentino and buts onto land on the near side of the water, cutting the drainage. The waters of the severed portion rise till the pressure is great enough to wash it all away, a natural phenomenon that occurs every few years and is indeed a wonder to behold. All this can be viewed closely from sheltering woods with walk-ways, hummingbirds and parrots – these birds being associated in most people's minds with the tropics. El Calafate (51° S) is the town nearest the park. Here *Nothofagus betuloides* (Guindo), *N. antarctica* (Ñire), and *N. pumilio* (Lenga) are the dominant trees; lesser species are *Drimys winteri* (Winter's Bark) and *Embothrium coccineum* (Chilean Firebush), aflame in late spring to early summer.

Over the straits of Magellan is the main island of the Tierra del Fuego archipelago. Here the Andes take a swing eastwards and the humid westerlies carry precipitation along the longitudinal valleys to points much further east than on the continent. Here the woods grow to the very south-eastern tip and in Staten Island's sheltered nooks, out of the force of the "Furious Fifties". Here grow the same species as further north, but tree-line is much lower and easily reached in a pleasant hike. The **Tierra del Fuego National Park** is but a few kilometres west of Ushuaia (about 55° S) and has the peculiarity that it gives onto the sea-water of the Beagle Channel, so steeped in history through exploration, Charles Darwin, and sacrifice. This is truly "the Uttermost Part of the Earth".

18.1.4. The Central and Eastern Patagonian National Parks

Laguna Blanca National Park (39° S) with its 11,263 hectares of grass and a few stunted trees, is to the west of the nearby town of Zapala, and is noted for the birdlife inhabiting its lakes.

In the "bad lands" of central Patagonia is the **Monumento de los Bosques Petrificados,** at present being enlarged to some 60,000 hectares, where gigantic petrified trunks of *Araucarias* some 130 million years old are scattered over parts of the surface, contrasting with today's vegetation that has a struggle to survive in such a hostile environment. It is in the middle of nowhere (about 220 km from Puerto Deseado – 48° S - or Caleta Olivia), off Route 3, at kilometre post 2074, then westwards for 50 kilometres along provincial route 49.

Monte Leon National Park is on the Atlantic coast and includes some 60,000 hectares of steppe, south of the river Santa Cruz. The coastal wildlife includes a great penguin nesting colony, four species of cormorants, and southern sea-lions (*Otaria flavescens*).

18.1.5. Table of useful data

National Park	Park HQ	Size ha	Created	Location
Laguna Blanca	Ejército Argentino 217 8340 Zapala Prov. Neuquén Tel.: 02942–431 982 lagunablanca@apn.gov.ar	11,263	1940	30 km south-west of Zapala
Lanín	Emilio Frey 749 8370 San Martín de los Andes Prov Neuquén Tel.: 02972–427 233 lanin@apm.gov.ar	412,000	1937	S.M.Andes
Los Arrayanes	San Martín 24 8400 S. C.de Bariloche	17,53	1971	Villa La Angostura
and **Nahuel Huapi**	Prov. Rio Negro Tel.: 02944–423 111 / 423 121 02944-422 734 nahuelhuapi@apn.gov.ar	710,000	1934	Bariloche
Lago Puelo	9211 Lago Puelo Prov. Chubut Tel.:02944-499 232 pnpuelo@red42.com.ar	27,674	1937	Lago Puelo and El Bolsón

National Park	Park HQ	Size ha	Created	Location
Los Alerces	9201 Villa Futaufquen Prov. Chubut Tel.: 02945-471 015/471 020 losalerces@apn.gov.ar	263,000	1937	50 km west of Esquel
Perito Moreno	Av. San Martin 882 9311 Gob. Gregores Prov. Santa Cruz Tel.: 02962-491 477 peritomoreno@apn.gov.ar	115,000	1937	220 km west of Gregores
Los Glaciares	Av. Libertador 1302 9405 El Calafate Prov. Santa Cruz Tel.: 02902-491 005, 491 545, 491 788 losglaciares@apn.gov.ar	724,000	1937	west of Calafate
Tierra del Fuego	San Martín 1395 9410 Ushuaia Prov. de Tierra del Fuego Tel.: 02901-421 315 tierradelfuego@apn.gov.ar	63,000	1960	Ushuaia
Monte León	Belgrano y 9 de Julio 9300 Purto de Santa Cruz Prov. Santa Cruz Tel.: 02962–489 184 monteleon@apn.gov.ar	62,168	2004	30 km south of Piedrabuena and Río Santa Cruz
Bosques Petrificados	H.Irigoyen 2044 9011 Caleta Olivia Prov. Santa Cruz Tel.: 0297-485 1000 bosquespetrificados@apn.gov.ar	13,700 (60,000 in future)	1954	50 km west of km 2074 on Route 3
Casa Central APN	Av. Santa Fe 690 1059 Buenos Aires Tel.: 011-4311-6633 4311-0303 www.parquesnacionales.gov.ar informes@apn.gov.ar			

18.1.6. Further reading

We suggest: Erize et al. "Los Parques Nacionales de la Argentina"
Chebez, J. C.; Guía de las Reservas Naturales de la Argentina; Patagonia Norte y Patagonia Austral.

18.2. Chile

by Pablo Lépez*

The following short descriptions of some of the most interesting National Parks (PN) of southern Chile has been made from a purely didactic and personal standpoint and does in no way imply an objective assessment of the included or omitted PN.

18.2.1. Parque Nacional Conguillío

The park has received its name from *Lake Conguillío* – which in Mapuche means "water with *piñones* [here: seeds of *Araucaria araucana*]". In 1950, the area was declared "Forest Reserve Conguillío" and upgraded to "National Park" in 1970. It comprises 60,832 ha, located on the Andean foothills, about 148 km to the north-east of Temuco, capital of the Region IX (Region of of the Araucarias).

Access to the park from Santiago (Chile's capital) by travelling 677 km to the south, either by aircraft or on land to Temuco, wherefrom you can head for one of the two entrances: (a) Curacautín or (b) Melipeuco.

(a) Leaving Temuco on the south-east (Avenida Pérez Canto), you arrive at the entrance to the sector of Laguna Captrén after approximately 23 km.

(b) From Temuco to Melipeuco by public transport or private car. Take then the road to Paso de Icalma; after 2 km you will find the turn-off to Conguillío, leading to the sector of the Truful-Truful Falls.

As regards the scenery, the dominating element is the volcano Llaina (reaching 3125 m above sea level), one of Chile's most active volcanoes during the past 100 years, which has had a deep impact on the landscape, giving origin to rivers, lakes and lagoons, as well as having a decisive influence on the present-day vegetation.

Within the park, the main forest types are those of the evergreen *Araucaria araucana* (Monkey Puzzle) and of the deciduous *Nothofagus pumilio* (Lenga). In the lower sectors, the forests consist of other deciduous species of *Nothofagus* (southern beeches): *N. obliqua* (Roble Beech) and *N. alpina* (Raulí) – which associate with trees of lesser size, such as *Gevuina avellana, Lomatia hirsuta,* and *Embothrium coccineum* (Chilean Firebush). The undergrowth of these forests is usually dense, characteristically with several species of the bamboo *Chusquea*.

As one approaches the summits, the forest recedes, giving way to a more shrubby vegetation *(matorral),* dominated by the two deciduous species *N. antarctica* (Antarctic Beech) and *N. pumilio* (Lenga), the latter one also growing stunted and shrub-like near the altitudinal limit of the vegetation.

From my personal point of view, the main attraction of the park lies in the forests of *Araucaria araucana,* an endemic conifer of Chile and Argentina (see description on p. 61f) , generally restricted to rocky, sandy areas on altitudes where snow covers the soil for long seasons.

Visitors to the PN Conguillío will find a network of well-signposted nature trails that lead into the forests and run along the lagoons; there is also a path to the volcano Llaina.

I recommend visiting the park between December and March choosing one of the auto-guided educational paths, e.g. "Las Vertientes" or "Las Araucarias". These trails have photo-metallic display panels which convey to the visitor a deeper insight into the ecosystems in question.

The park has several suitable areas for camping, grocer's shops, places where to hire boats, and even a ski centre for the winter season.

18.2.2. Parque Nacional Puyehue

1914 saw the creation of the *Forest Reserve Puyehue* which, in 1941, was transformed into the *PN Puyehue,* covering an area of 65,000 ha. The leading idea was to safeguard an area of outstanding scenery and native forests of southern Chile. In 1981, the surface of the park was enlarged to include 106,972 ha.

To reach the park from Santiago, you can travel by aircraft or on land to the city of Osorno, wherefrom, taking Ruta 215 in the direction of the International Border Cardenal Samoré, you will pass the village Entre Lagos and arrive at the entrance to the park after 88 km.

The comfortable roadway of access and the high standard of the park's infrastructure have contributed to make it one of Chile's most frequented parks. Among its facilities are: a centre of ski, thermal baths, several hotels, cottages *(cabañas)*, and an interesting canopy circuit.

As regards the vegetation, the main kind of forest belongs to the *evergreen moist type,* due to the high degree of rainfall in this region, with *Nothofagus dombeyi* (Evergreen Southern Beech) and *Eucryphia cordifolia* (Ulmo), or *Laureliopsis philippiana* (Tepa) and *Weinmannia trichosperma* (Tineo) as dominant species.

In the best accessible areas of Aguas Calientes, the main species are *Eucryphia cordifolia, Nothofagus dombeyi* and *Saxegothaea conspicua* (Prince Albert's Yew), accompanied by *Aextoxiconn punctatum* (Olivillo) and *Weinmannia trichosperma* (Tineo). In the lower strata, an abundance of

* English version by B. Gut.

shrubs, ferns, mosses and lichens convey to the forests a remarkable floristic diversity.

With increasing altitude, the forests change: *Nothofagus dombeyi* and *Laureliopsis philippiana* are joined by *Saxegothaea conspicua,* which eventually becomes the dominant species. As we approach the summits, pure forests of *Nothofagus betuloides* appear, with a dense underwood of *Chusquea* sp. However, from 1000 m above sea level upwards, *Nothofagus pumilio* (Lenga) becomes the dominant species.

In my opinion, the PN Puyehue is an excellent choice for those visitors to Chile who are short in time and who are keen on getting acquainted with the manifold, exclusive forest ecosystems of these southern regions of our planet, since they occur here, in the vicinity of Osorno, in a restricted, well accessible area, counting with a good infrastructure. Winter and summer are appropriate seasons for visiting the park.

I especially recommend Canopy Puyehue, located in a exuberant forest close to the Aguas Calientes sector. It is ideal for those who wish to look at epiphytes (ferns, mosses, liverworts, lichens, etc.) and to study a forest starting from its tree tops.

18.2.3. Parque Nacional Vicente Pérez Rosales

Established in 1926, Chile's oldest National Park covers an area of 251,000 ha.

Starting from Santiago, it can be reached by first travelling 1016 km southwards by aircraft or on land to Puerto Montt and then 18 km onwards to Puerto Varas, wherefrom Ruta 215 leads, after another 55 km, to the entrance of the park in the Petrohué sector.

Featuring a manifold, overwhelming scenery, the PN Vicente Pérez Rosales has become a favourite destination with visitors to the Lake District. It encompasses: volcanoes; one of the most beautiful virgin lakes of southern Chile ("Todos los Santos"); several mighty watercourses, such as the river Petrohué, famous for its waterfalls; furthermore, vast areas of untouched native forests.

Visitors can choose among a rich variety of activities to enjoy their stay amidst this landscape: walking on nature trails (which are easily accessible from the automobile roadways); looking at plants and watching birds; taking thermal baths; skiing; fishing; engaging themselves in excursions on ships and boats – besides recovering and relaxing in cosy hotels or cottages *(cabañas)*.

As in the PN Puyehue, the dominant kind of forests present in the PN Vicente Pérez Rosales also belongs to the evergreen type, the main species being *Nothofagus dombeyi* (Evergreen Southern Beech), which grows up to 1000 m above sea level and associates especially with *Eucryphia cordifolia* (Ulmo), *Laureliopsis philippiana* (Tepa), *Weinmannia trichosperma* (Tineo), as well as with a rich variety of shrubs, climbers, the bamboo genus *Chusquea,* and ferns. Patches of *Fitzroya cupressoides* (Patagonian Cypress) can be found on steep slopes and boggy soils of difficult access, between 800 and 1000 m above sea level.

Gaining in altitude, *Nothofagus pumilio* (Lenga) appears, at first associated with *N. dombeyi,* until it eventually prevails, forming pure communities up to the limits of the arboreal vegetation, where it grows stunted and shrubby.

I warmly recommend this park to those visitors who aim to become acquainted with the Andean landscape of the Lake District. I believe that the one-day excursions across the lake "Todos los Santos" to the Peulla sector of the park is one of the most rewarding choices throughout the year, offering broad panoramic views of the area.

18.2.4. Parque Nacional Alerce Andino

This park was established in 1982. Located in a mountainous zone to the south of Lake Chapo, between the Seno (bay) de Reloncaví and the estuary carrying the same name, it covers an area of 39,255 ha and reaches, at the summit of Cerro Cuadrado, an altitude of 1558 m.

Access: From Santiago travel by aircraft or on land to Puerto Montt, capital of Region X of Chile. Starting from this town, one can enter the park at several sectors:

(a) Taking the road to Correntoso and Lago Chapo (45 km);
(b) Along the south, taking the road to Lenca (36 km of gravel road, passable throughout the year); continuing along the valley of the Río Chaicas (this last stretch only for 4X4-vehicles);
(c) After having crossed the bridge Chamiza and taken the road to Automó, one reaches the park in about 45 min.

The predominant kind of forest is the typical *evergreen moist forest,* sustained by the high amount of rainfall in this region – and there are several sub-types to be distinguished: *Fitzroya cupressoides* (Patagonian Cypress), *Nothofagus nitida* (Evergreen Southern Beech of Chiloé), and *Nothofagus pumilio* (Lenga).

The main attractiveness of the park lies in the millenary specimens of *Fitzroya cupressoides,* trees that grow very slowly and that represent the dominant species on a surface of about 20,000 ha of this park. Several paths lead to sites from where these trees can be admired and studied, e.g.: Laguna Sargazo – Laguna Fría and Saltos Río Chaicas. These nature trails direct the visitor into beautiful, steep forests. To visit the *Fitzroya* forests is a marvellous experience for nature-lovers; and to stroll along these unique organisms of our planet that have lived for 3500 years is a moving experience that may encourage a deep reflection.

A characteristic species of the *Fitzroya* forests is e.g. *Philesia magellanica,* an endemic shrub with beautiful flowers that resemble those of *Lapageria rosea,* Chile's national flower, which grows in the Central Valley. Important dendro-chronological studies have been made on the annual rings of *Fitzroya* in order to determine the climatic variability, also in comparison with analogous studies in the northern hemisphere.

Rustic stand-in cottages of 30 m^2 are available for overnight stays in the park; there is also a small camping area. It is necessary to buy provisions beforehand in Puerto Montt, Lenca or Correntoso. In view of the climatic conditions, it is advisable to visit the park between November and March.

18.2.5. Parque Nacional Chiloé

The PN Chiloé is located on the Coast Cordillera of the Isla Grande de Chiloé (Large Island of Chiloé). The park comprises a total surface of 43.057 ha, composed of three separate areas: Chepu (7,800 ha), Anay (35,207 ha), and the islet of Metalqui (50 ha).

Access: From Santiago by aircraft or on land to Puerto Montt (1016 km), wherefrom by ship to the Isla Grande de Chiloé (daily services).

From my point of view, the main importance of the park consists in the fact that it is one of the few schemes protecting still virgin coastal ecosystems, which are otherwise strongly altered and degraded in southern Central Chile. Personally, I cherish the beautiful scenery of the park, conveying a network of forest-nature trails in close vicinity to the sea, thus safeguarding a ribbon of the shores of the Pacific Ocean.

As elsewhere in southern Chile, the dominant forests are made up of evergreen species. Abundant are: *Laureliopsis philippiana* (Tepa), *Aextoxicon punctatum* (Olivillo) and *Nothofagus dombeyi* (Evergreen Southern Beech), accompanied by *Luma apiculata* (Myrtus Luma = Orange-Barked Myrtle) and *Amomyrtus luma* (Luma).

Boggy, poorly drained areas are characterised by "Tepuales", virtually inaccessible thickets formed by *Tepualia stipularis* (Tepu), an arboreal Myrtaceae growing with twisted, slippery stems. The nature trail "El Tepual" offers an educational tour through one of these "tepuales".

In the Abtao sector of the park, we find the southermost coastal forests of *Fitzroya cupressoides* at an altitude of 600 m above sea level.

Besides its importance regarding nature conservation, Chiloé has many other natural as well as cultural attractions.

As to its infrastructure, the park offers the following facilities: Sector Cole Cole has an area suitable for 5 tents. Sector Chanquín has 5 cottages *(cabañas),* an area with space for 20 tents, and several stand-ins *(refugios)* along its paths.

It is advisable to buy provisions in Cucao, Chonchi or Castro; fuel is only available in the latter two places.

18.2.6. Parque nacional Torres del Paine

Located between the main chain of the Cordillera de los Andes and the Patagonian steppe, the PN Torres del Paine covers a surface of 181,414 ha. Established in 1959, it was declared as Reserve of the Biosphere by the UNESCO in 1978.

To reach the park from Santiago, you travel 3100 km. There are direct flights to Punta Arenas, wherefrom one continues on land by private transport to Puerto Natales. Leaving Puerto Natales towards the north, one comes, after approximately 23 km to two turn-offs:

1) By taking the left and continuing for about 122 km, one arrives at the park's administrative headquarters.
2) By choosing the turn-off to the right, one enters the park through Portería Sarmiento.

Magnificent scenery is the main feature of the park. Among its principal attractions are: the Cuernos (the Northern, Principal, and Eastern Horns), the Torres (Southern, Central, and Northern Towers), the lakes Sarmiento, Nordenskjold, Pehoé, Grey, Paine, and Dickson, as well as the lagoons Verde, Azul, and Honda.

The park is rich in contrasting types of vegetation: The treeless steppe, with a scant herbaceous vegetation, typical of the cold climate; the forests of *Nothofagus pumilio* (Lenga) and also of *N. betuloides* (Coigue de Magallanes, Guindo), poor in accompanying species. Other arboreal species are *Nothofagus antarctica* (Ñire), *Embothrium coccineum* (Chilean Firebush), and *Drimys winteri* (Winter's Bark).

There is also a rich variety of aquatic biotopes.

Visitors, who wish to walk through the *Nothofagus pumilio* and *Nothofagus betuloides* forests amidst large and well developed trees, should choose the path towards Lake Grey along the bridge over the river Pingo. Further small woods of these southern beeches grow near Lake Pehoé.

Thanks to its good infrastructure, the park has become one of the favourite destinations with tourists to Chile. Among the numerous offerings figure: Various types of excursions and guided tours, walking along the nature trails, looking at the flora, watching animals, enjoying the fine scenery, or simply relaxing in nice hotels and cosy cottages.

I especially recommend this park to those visitors who have sufficient time at their disposition to plan a stay of

several days in this vast and manifold landscape and who are keen on getting acquainted with the southernmost woodlands of the world.

18.2.7. Further information

Visitors who would like to acquire a deeper insight into the forest ecosystems of southern Chile (above all the Typical Valdivian Forest or the Temperate Coastal Rainforest) can do this by arranging excursions to the areas in question. Experienced local guides will show the various species composing the forests and explain the interwoven relationships ruling these unique temperate ecosystems. To contact, see: www.valdivianrainforesttour.cl.

See also:
Corporación Nacional Forestal (CONAF)
Av. Bulnes 259
Santiago
Chile
Tel.: (0056) 3900125
www.conaf.cl
E-mail: consulta@conaf.cl

18.3. Private initiatives in Southern Argentina and Chile

18.3.1. Pumalín Park and Conservación Patagónica

by Guido Vittone and Bernardo Gut

Among private efforts to protect habitats in Patagonia, the pioneering projects headed by the North Americans Douglas and Kristine Tompkins deserve singular attention. They began in 1991, when D. Tompkins bought Reñihué Ranch with 17,000 ha of evergreen temperate rainforest on the Chilean mainland, facing the island of Chiloé. These extensive grounds, set aside from exploitation, were enlarged over the years with 283,000 ha of nearly contiguous parcels, acquired by *The Conservation Land Trust*. This US environmental foundation donated the protected area to the Chilean *Fundación Pumalín* that administers *Pumalín Park* and develops it as a kind of national park, with access to the general public.

Parque Pumalín was declared a nature sanctuary in 2005, a special designation of the Chilean State, granting it additional environmental and non developmental protection. By this time, other initiatives of Tompkins had led to the foundation of *Conservación Patagónica,* created in 2000 to protect and restore wild land ecosystems and biodiversity in Patagonia. – by acquiring and protecting privately owned wild lands, and ultimately returning these landholdings to the public domain for permanent protection in the form of national parks or reserves.

Conservación Patagónica not only played a vital role in the creation of Parque Nacional Monte León on the Atlantic coast (Argentina) in 2001, when it donated 63,000 ha, it has also strived to generate a connected system of ecological reserves, enlarging protected areas and linking them together within Argentina and Chile, respectively, as well as across their mutual borders. With such an objective in mind, *Conservación Patagónica* purchased Estancia El Rincón in Argentina, and is now aiming to unite it with the adjacent *Parque Nacional Perito Moreno,* located in the Argentine province of Santa Cruz.

The most ambitious project of *Conservación Patagónica* was initiated in 2004 when it bought Estancia Chacabuco, with a surface of 70,000 ha, located in the Chacabuco valley, at 47° S, in Chile. In its western parts, pristine forests of *Nothofagus pumilio* and *Nothofagus antarctica* predominate, whereas drier steppes are typical of the eastern parts, towards the border to Argentina. The area now connects two previously existing, but hitherto separated nature reserves.

Immediate measures were undertaken to reduce the pressure of grazing; furthermore, fence lines, introduced plant species, and unnecessary buildings were removed. Over the next seven years, the goal is to create a new national park, covering about 303,000 ha and complying with Chile's highest standards of conservation. *Conservación Patagónica* also aims to stimulate a shift in the local economy from pastoral agriculture towards a kind of responsible, ecologically centred tourism.

The leaders of the project are aware of the need to include neighbours of the park in order to create a shared conviction of the need to protect wild lands and biodiversity. This consciousness is still poorly developed, mainly due to the cultural and historical background. Thus, the project is conceived as a long term process, a slow and difficult effort, but it is considered to be essential if new forms of "sustainable" living and economy are to be achieved.

Finally, the authors of the project hope that it may act as a model for other private conservation initiatives, albeit at a more modest scale. Wild lands philanthropy has been responsible for thousands of projects all over the world, protecting plant life and animals in various types of habitats –e.g. wetlands, forests, prairies, deserts, and so forth.

It is said that in North America there is not one national park that has not had some measure of private philanthropy involved in its development; but the same holds

true for most of the national parks of both Argentina and Chile, Monte León (in Argentina) and Pumalín Park (in Chile) being only two recent examples of private donors benefiting the general public.

18.3.2. Parque Oncol

Pablo Lépez*

In 1989, Arauco Enterprises created *Parque Oncol* on the hills carrying the same name and located about 28 km to the Northwest of the city of Valdivia, and only 5 km from the well-known shore of Pilocura. It covers a surface of 754 ha on the Coastal Range, between the Pacific Ocean to the West and the Nature Sanctuary of Río Cruces to the East. In Parque Oncol, the Coastal Range reaches an altitude of 715 m above sea level, the summit conveying overwhelming outlooks on clear days.

As large areas of the Coastal Range remained free from ice during the last Ice Age, the area of the actual Parque Oncol harboured many plant species, animals, and various ecosystems in those inhospitable periods. Not surprisingly therefore, one of the peculiarities of Parque Oncol is that it preserves the evergreen, temperate Valdivian Rainforest in its pristine, exuberant appearance. Similar types of forest with related species are known from New Zealand.

These forests resemble to a certain extent tropical forests, but are located in temperate, extremely humid regions, with an annual rainfall topping – in Oncol – more than 4600 mm (main precipitations from March to November), and temperatures that remain even throughout the year.

Parque Oncol is home to several types of forest, above all: T*epualia-stipularis*-forest ("Tepuales"), in extremely moist (wet) areas; *Laureliopsis-philippiana* and *Weinmannia-trichosperma*-forest ("Tepa-Tineo-forest"), an evergreen, multilayered, vital forest which thrives best at an altitude between 400 and 675 m above sea level; *Drimys-winteri*-forests ("Canelo-forests"), which usually develop in areas where the *Laureliopsis*–forest has been chopped down; *Aextoxicon-punctatum*-forest ("Olivillo-forest"), which originally had covered the entire western slopes of the Chilean Coastal Range, from 29° S to 43°S, i.e. from the IV. to the X. Region of Chile.

Among the typical plant species are:

1. Trees: *Aextoxicon punctatum* R. et P. (Olivillo), *Drimys winteri* J.R. Forster et G. Forster (Canelo), *Eucryphia cordifolia* Cav. (Ulmo), *Luma apiculata* (DC.) Burret (Arrayán), *Laurelia sempervirens* (R. et P.) Tul. (Laurel), *Laureliopsis philippiana* (Looser) Schodde (Tepa), *Saxegothaea conspicua* Lind. (Mañio hembra).
2. Shrubs: *Lomatia dentata* (R. et P.) R. Br. (Piñol), *Griselina jodinifolia* (Griseb.) Taub. (Tribillo, Yelmo chico), *Acrisione denticulata* (H. et A.) Nord. (Palpalén), *Ugni molinae* Turcz. (Murta);
3. Creepers: *Lapageria rosea* R. et P. (Copihue), *Luzuriaga radicans* R. et P. (Quilineja);
4. Epiphytes: *Fascicularia bicolor* (R. et P.) Mez (Puñeñe).

Regarding the animal species we may point at: Robust Woodpecker (*Campephilus robustus*, Carpintero Grande), White-throated Hawk (*Buteo albigula*, Aguilucho Chico), Rufous-legged Owl (*Strix rufipes*, Concón (Chile), Lechuza Bataraz (Argentina)), Puma (*Felis concolor*), Colpeo Fox (*Dusicyon culpaeus magellanicus*), Pudu (*Pudu pudu*), Güigna (*Felis guigna*). Furthermore, 9 species of amphibians have been identified in Parque Oncol; among them, Darwin's frog (*Rhinoderma darwinii*. Sapito de Darwin).

One of the main attractions of Parque Oncol are several trails which reach lookout towers that offer spectacular overviews. Extensive canopy tours bid a unique way to view the top of the forests.

A guest house and a camping site are at the disposition of the visitors.

A journey to Parque Oncol can strongly be recommended to tourists who visit Valdivia. Parque Oncol is, above all, an excellent option for all those who aim to get acquainted with the Valdivian forests, but refrain from travelling long distances, often on gravel roads, to reach several of the most important National Parks.

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* English version by B. Gut

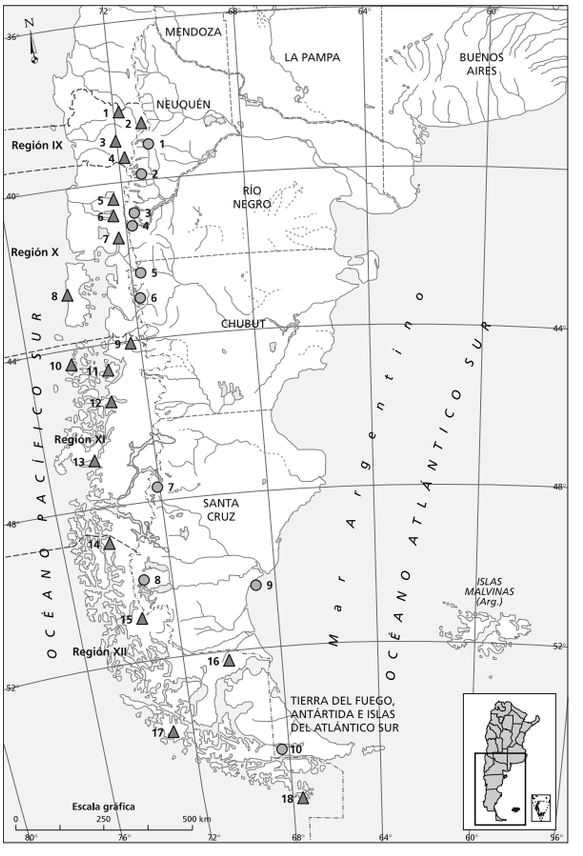


Fig. 18.1: Location of important National Parks in Southern Argentina and Chile

ARGENTINA

- ○ 1 PN Laguna Blanca (Prov. Nuequén; 11,263 ha)
- ○ 2 PN Lanín (Prov. Neuquén; 412,000 ha)
- ○ 3 PN Los Arrayanes (Prov. Neuquén; 1,753 ha)
- ○ 4 PN Nahuel Huapi (Prov Neuquén y Río Negro; 710,000 ha)
- ○ 5 PN Lago Puelo (Prov. Chubut; 27,674 ha)
- ○ 6 PN Los Alerces (Prov. Chubut; 263,000 ha)
- ○ 7 PN Perito Moreno (Prov. Santa Cruz; 115,000 ha)
- ○ 8 PN Los Gaciares (Prov. Santa Cruz; 724,000 ha)
- ○ 9 PN Monte León (Prov. Santa Cruz; 62,168 ha)
- ○ 10 PN Tierra del Fuego (Prov. Tierra del Fuego; 63,000 ha)

CHILE

- 1 △ PN Tolhuaca (Región IX, 6,474 ha)
- 2 △ PN Conguillío (Región IX; 60,833 ha)
- 3 △ PN Huerquehue (Región IX; 1,2500 ha)
- 4 △ PN Villarica (Región IX; 63,000 ha)
- 5 △ PN Puyehué (Región X; 106,772 ha)
- 6 △ PN Vicente Pérez Rosales (Región X; 231,000 ha)
- 7 △ PN Alerce andino (Región X; 39,255 ha)
- 8 △ PN Chiloé (Región X; 43,057 ha)
- 9 △ PN Queulat (Región XI; 154,093 ha)
- 10 △ PN Isla Guamblin (Región XI; 10,625 ha)
- 11 △ PN Isla Magdalena (Región XI; 157,626 ha)
- 12 △ RN Río Simpson (Región XI; 41,634 ha)
- 13 △ PN Laguna San Rafael (Región XI; 1,742,000 ha)
- 14 △ PN Bernardo O'Higgins (Región XII; 3,525,901 ha)
- 15 △ PN Torres del Paine (Región XII; 181,414 ha)
- 16 △ PN Pali Aike (Región XII; 5,030 ha)
- 17 △ PN Alberto de Agostini (Región XII; 1,460,000 ha)
- 18 △ PN Cabo de Hornos (Región XII; 63,093 ha)

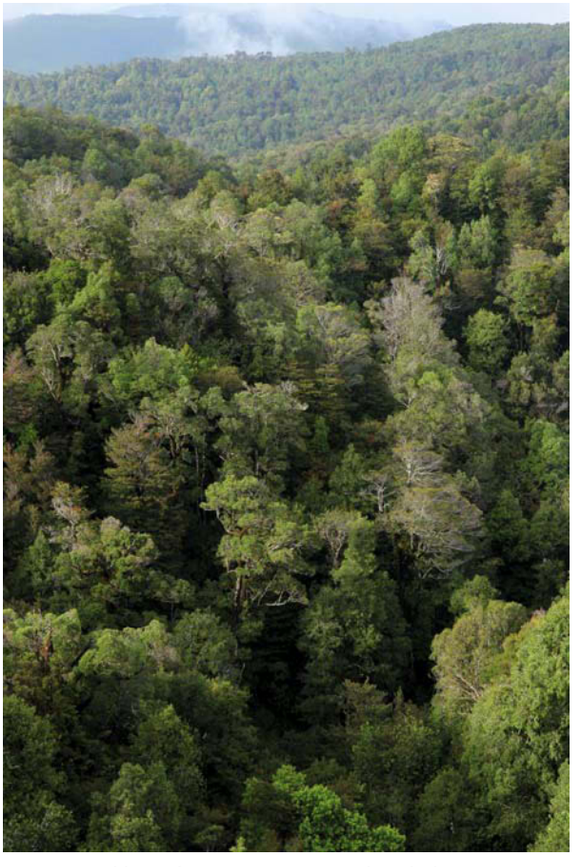


Fig. 18.2: Valdivian forest in Parque Oncol, with the permission of P. Lépez

Fig. 18.3: *Acrisione denticulata* (H. et A.) Nord, a typical shrub, up to 6 m tall, in moist, open places of Valdivian forests

19. Carl Skottsberg's «modest expedition» – A look at the scientific discovery of Patagonia

by Guido Vittone*

We owe the scientific discovery of Patagonia to the unflinching efforts of European, American, Argentine and Chilean explorers who undertook adventurous explorations on their own behalf or who participated in different schemes of scientific expeditions. Several of these enterprises deserve to be taxed as heroic pioneer deeds, almost unconceivable in our days. Among these, the remarkable "Swedish Magellanic Expedition" (1907–1909) led by Skottsberg stands aloft. It provides an extraordinary insight into the energy, courage, and perseverance involved in an enterprise of such a magnitude. However, the fact that we concentrate ourselves in retracing Skottsberg's voyage does in no way imply that we either intend to diminish the efforts of so many other explorers or to relegate the results they obtained to a second level.

With respect to the botanical side of the scientific discovery of Patagonia, we gratefully point to the following publications:

Moore, D. M., *Flora of Tierra del Fuego*.– Shropshire: Anthony Nelson, and Missouri: Missouri Botanical Gardens, 1983;

Marticorena, C., "Historia de la exploración botánica de Chile", en *Flora de Chile*, Vol. I, p. 1–62.– Concepción: Universidad de Concepción, 1995;

Del Vito, L. A.; E. M. Petenetti y M. N. Correa, "Evolución del conocimiento botánico de la Patagonia Argentina", en *Flora Patagonica*, Parte I, Tomo VIII, p. 167–265.– Buenos Aires: INTA, 1998.–

When, in 1904, Carl Johan Fredrik Skottsberg (1880–1963), Swedish botanist, phyto-geographer and explorer, had returned from taking part in the Swedish Antarctic Expedition led by Otto Nordenskjold (1869–1928) from 1901 to 1903, and had begun to work out his notes and collections, it happened to him, "that every now and then questions cropped up which, for want of material, had to be left unanswered. Gradually also quite new problems presented themselves, and the thought of returning once more to some of the countries I had visited soon arose" (Skottsberg, p. vii). He therefore "considered the possibility of planning a modest expedition, principally for geological and botanical purposes" (p. vii). Thus was born the enterprise, afterwards called "Swedish Magellanic Expedition", composed of Skottsberg (leader) and his colleagues Percy D. Quensel (1881–1966) and Thore G. Halle (1884–1964), which left Gothenburg on September 10, 1907.

In the first stage of their voyage, Skottsberg and Halle travelled around the Falkland Islands, while Quensel was heading for the Paine and Lake Argentino, aiming to accomplish geological and glaciological observations in areas poorly known in those days, but which in our time are one of the main tourist destinations.

In the course of the southern spring of 1907, Skottsberg went round the islands, collecting material, looking at the vegetation, photographing *Hebe elliptica* (G. Forst.) Pennell (= *Veronica elliptica* G. Forst.) – "the largest land plant of all Falkland" (p. 13), discovering the remnants of old forests – buried under successive slidings of soil –, and noticing the impact of sheep-grazing on certain grasses (e.g. *Poa flabellata* (Lam.) Hook. f.).

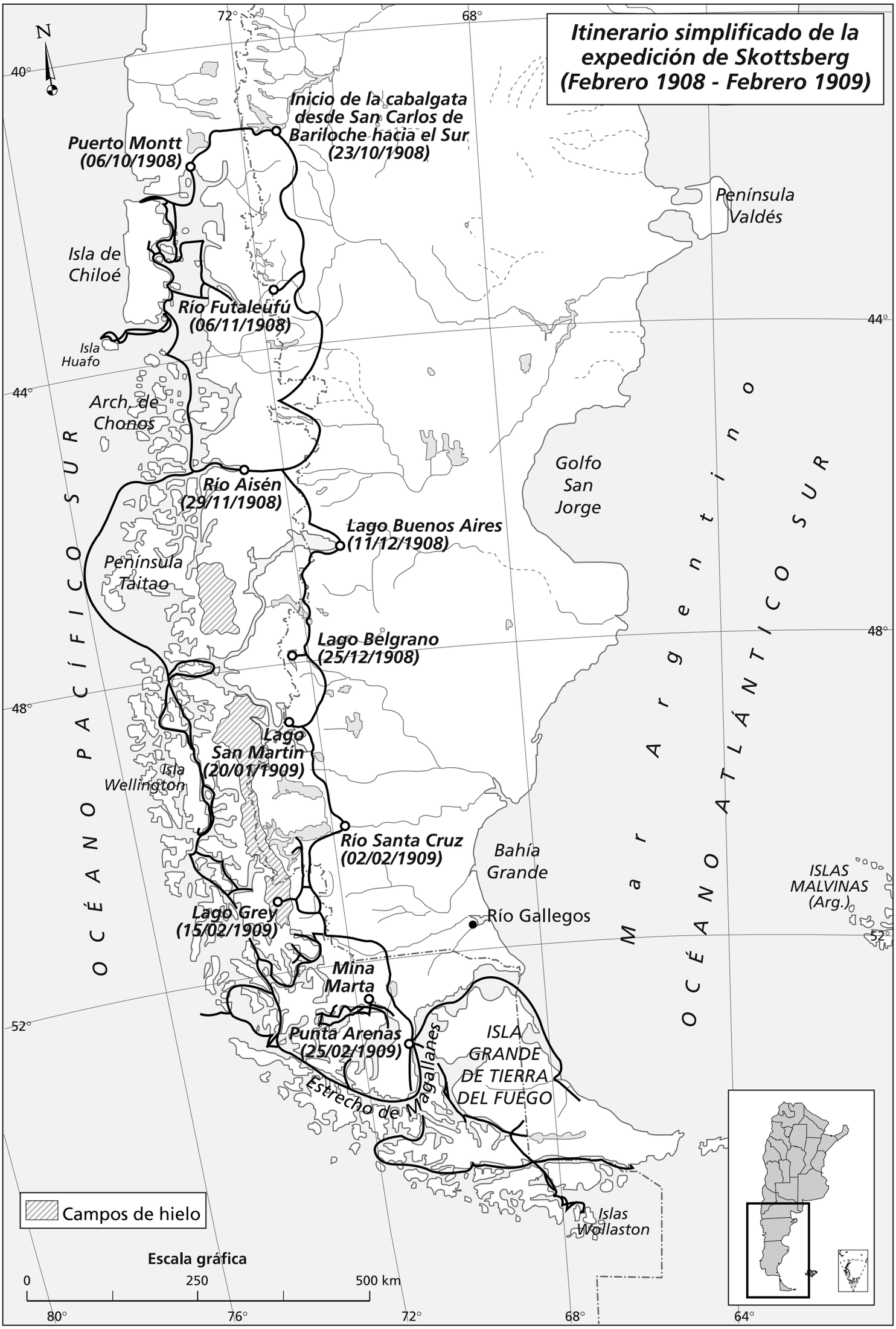
After having explored the archipelago for more than three months, the expeditionaries embarked on February 12, heading for Punta Arenas. As they were approaching this settlement in the night of February 14, "the sky shone bright red ...: the forest south of the town was on fire; it made a mighty lighthouse that showed us the way to the roads..." (p. 31).

The history of the conquest and colonisation related to the strait that separates the island of Tierra del Fuego from the American continent goes back to Magellan's (ca. 1480–1521) discovery of this passage in 1520. Soon afterwards, new voyagers repeatedly attempted to take possession of the new lands. In 1584, Spanish colonists and soldiers disembarked on the northern coast and founded a colony that was to subsist with great difficulty for a few years. Lack of food and the attacks by the indigenous people brought this attempt to an end – the place thereafter being called "Puerto Hambre" [Port Famine].

In 1616, the discovery of the alternative route along Cape Horn soon set back the importance of the Strait. The entire region received a new impulse towards mid 18th Century, with new European settlers, the introduction of sheep from the Falklands, and the upcoming of steam-ships.

Punta Arenas was founded in 1843. For several decades, it was merely a colony of deported politicians and military men. Among the first naturalists that penetrated into these areas was Bernardo Philippi, who was sent as plant collector for the Museum of Natural History of Berlin, and eventu-

* English version by B. Gut.


Itinerario simplificado de la expedición de Skottsberg (Febrero 1908 - Febrero 1909)
N
72°
68°
40°
44°
48°
52°
80°
76°
64°
Inicio de la cabalgata desde San Carlos de Bariloche hacia el Sur (23/10/1908)
Puerto Montt (06/10/1908)
Península Valdés
Isla de Chiloé
Río Futaleufú (06/11/1908)
Isla Huafo
Arch. de Chonos
Río Aisén (29/11/1908)
Golfo San Jorge
Lago Buenos Aires (11/12/1908)
Península Taitao
Lago Belgrano (25/12/1908)
Lago San Martín (20/01/1909)
Isla Wellington
Río Santa Cruz (02/02/1909)
Bahía Grande
ISLAS MALVINAS (Arg.)
Lago Grey (15/02/1909)
Río Gallegos
Mina Marta
Punta Arenas (25/02/1909)
ISLA GRANDE DE TIERRA DEL FUEGO
Estrecho de Magallanes
Islas Wollaston
OCÉANO PACÍFICO SUR
Mar Argentino
OCÉANO ATLÁNTICO SUR
Campos de hielo
Escala gráfica
0
250
500 km

ally became governor of the Region of Magellan. He was killed in 1852 by aboriginals, as revenge for abusive treatment – of which Philippi could not be made responsible – they had suffered from prisoners fleeing from the prison of Punta Arenas.

From 1866 to 1869, Robert Cunningham (†1918) also worked in this region. His book, "Notes on the natural history of the Straits of Magellan and West coast of Patagonia" became the source of reference for many other explorers, especially for George Chaworth Musters (1841–1879), who at that time began his long journey to the north through the hitherto unknown inner land.

Alberto María de Agostini (1883–1960) was yet another great explorer of Patagonia. Arrived in 1910, this monk travelled to remote corners, unexplored in his days, undertook important ascensions and transmitted observations of every kind. The photographies of his book "Ande Patagoniche" (e.g. 1949) are a valuable testimony of the epoch, and bear evidence on the consequences of the man-provoked fires in Southern Patagonia.

Coming back to Skottsberg, we find him visiting Dawson Island, where the Roman Catholic Salesian mission station had long been established and had "partly converted the land into a sheep-farm, with Indians as labourers" (p. 35). Skottsberg and his companions were "very well received" by the missionary, Monseñor Fagnano. But Skottsberg remarks critically that in spite of the care administered by the missionaries, the Onas, Yahgans and Alookoloops "pine away". "It is the old story; the natives are subdued or won over, put into clothes, forced to live in houses, and turned into labourers; in some cases perhaps their life gets easier, but with the kind of civilization imposed on them, absurd and more than shallow, there follow diseases and a misery unknown before..." (p. 36).

Later on, at the eastern end of Admiralty Inlet (Seno Almirantazgo), they followed the valley of Río Azopardo upriver till they reached Lago Fagnano. They then climbed up the mountains to the Betbeder passage and the Paso de las Lagunas – as they called it –, a pass that leads from the Azopardo to the Beagle Channel and which might have been used by the Indians in earlier times.

Skottsberg compared the Andean flora of Tierra del Fuego with the Alpine flora of Europe, and he observes that "the former without doubt is left far behind, but nevertheless it has the same peculiar stamp, the same gay colours" (p. 50). He also mentions the "rare chance of following step by step the gradual change of evergreen into deciduous forest" (p. 55).

On Lago Fagnano, they found small islands, showing "beautiful traces of the glacial age in form of moraines, erratic blocks, and polished stones. The direction of the morainic ridges and the origin of the blocks showed to a certainty that the ice had moved west-eastward here" (p. 54f.).

During the winter's season, the Swedish expeditionaries decided to survey the extensive coastline of Western Patagonia, from the Strait of Magellan to the Island of Chiloé. Not a single corner of this entangled region had been safe from intense glaciations that contributed to design the characteristic relief of labyrinthine fjords and archipelagos.

Although R. FitzRoy (1805–1865) had accomplished a detailed survey between 1826 and 1836, there still remained much to be investigated about the channels. For instance, the inner part of Skyring Water was completely unknown at the outset of the 20th Century. Important discoveries in those years compelled geographers to draw new charts of several channels. And with respect to the inner land, the presence of enormous ice fields was barely suspected, and their true shape was still unknown but a few decades ago.

Counting with the support of the Chilean Navy, Skottsberg's expedition surveyed Otway and Skyring Waters, located near Punta Arenas. "Where the water narrows to Fitzroy Channel the country once more changes its nature, and we are on the edge of the Patagonian pampa, where groves of *Nothofagus antarctica* form a brushwood" (p. 64f.). On April 16, they anchored at the entrance to Fitzroy Channel, connecting Otway and Skyring: "It is a very narrow, shallow, and crooked passage, through which the tide rushes at a great speed. The passage entails innumerable changes of direction, soundings, and great caution: The shores are flat; we have entered the pampa zone, and find the outposts of civilisation on both sides" (p. 65). It is an area that reveals the dynamic transition from forest to steppe. The eastern coasts, bearing a desert-vegetation, are buried under thick stems from an ancient forest which is scarcely visible on the other side of these internal seas.

At the Estero de los Ventisqueros, a glacier inlet hardly known at the time, Halle and Skottsberg found some Andean plants "that thrive at sea-level, refreshed by the cool breath from the icy surroundings" (p. 70). Besides, they discovered an Indian path, uniting Skyring Water with Obstrucción Fjord, along which the light boats could be carried, thus avoiding lengthy detours on water.

Fig. 19.1: Itinerary of Skottsberg's expedition (February 1908–February 1909)

Not without danger, they navigated along narrow channels connecting places only named after shipwrecks. An unforeseen, rare sunny day, at the end of Smith Channel, induced Skottsberg, who was studying virgin forests, to compare the Chilean Channels with the Norwegian fjords: "As far as the numerous inlets running east from the Channels into the mountains are concerned, I think that this comparison is obvious... But in the outer appearance there is a big difference. In Patagonia Death seems to reign. The Channels are so silent... But the forest is magnificent, in spite of the utter silence prevailing there" (p. 83). Skottsberg describes *Pilgerodendron uviferum* and the ferns of arboreal growth and he admires *Philesia magellanica* J. Gmelin (= *Philesia buxifolia* Lam e. Poir.), an herbaceous plant, "which flowers also during midwinter... [and] with its large pink bells is almost unrivalled" (p. 84).

At about 51° S, Skottsberg "noticed a certain change in the vegetation. New trees and bushes appeared, especially... *Podocarpus nubigenus*" (p. 84).

Continuing to the North, they reached the English Narrows, where – 30 years later – Puerto Eden was to be founded, a settlement in which the distributed and diminished Alookoloop would be grouped together. In Skottsberg's days, these Channel Indians still subsisted, living traditionally, albeit in small numbers and in marked decline. He spent several days among them, visiting different families, and had an interpreter to help him to communicate with them. Skottsberg dedicates them an entire chapter of his book. Thanks to his testimony, we have at our disposal descriptions of the canoes that can be carried over land, of the arrows made of *Berberis,* of the clubs made from the roots of *Tepualia stipularis.* Towards the end of the chapter, Skottsberg warns that the scheme to collect the Channel Indians into the mission stations will only hasten the inevitable end, and he is well aware of the fact that all true assistance would come too late.

At latitude 48° S, mighty rivers drain through Canal Baker into the Pacific. Between this channel and the large Peninsula of Taitao, we find the Gulf of Penas, exposed to the violent western gales without protection. This was the site where, in 1741, the shipwrecked of one of Lord Anson's squadron had to bear enormous sufferings. A few of them, after having endured months of struggling for survival and desperate attempts to overcome the gulf, were led by canoeing Indians across the Peninsula of Taitao to the Island of Chiloé. John Byron's (1723–1786) "The narrative of the Honourable J. B. ..., containing an account of the great distresses suffered ... on the coasts of Patagonia ..." (1768) testifies to the tough nature of these localities and to the humans who managed to survive in such an environment.

To the north of 47° S, in the Island of Chiloé, another ethnic group of nomadic canoeing Indians had been under the bad Spanish influence since their early settlement in the 16th Century. Monks had crossed the Isthmus of Ofqui towards the end of the 18th Century, but the hydrological facts of the zone would only be investigated in Hans Steffens' (1865–1936) expeditions, the climax of which was, in 1893, the exploration of River Baker upwards to the Eastern steppes. This meticulous expedition had among its members the naturalist Santiago Hambleton.

Skottsberg's expedition devoted more than a month's time to the exploration of Chiloé and its surroundings. He travelled along the scarcely visited Western Coast and described the "Tepuales" (swampy forests of *Tepualia stipularis*) and bogs. On the continental side of this region, he ventured to undertake the strenuous crossing between the volcano Corcovado and the fjord Reñihue passing through brushwood, composed of "large miniature forests of bamboo (*Chusquea culeou*) and, more in the open, *Chusquea quila*.

Spaniards had been present on the island ever since 1558. Exploitation of the forest resources was of great importance. While on the coastal areas, the communities of *Fitzroya cupressoides, Pilgerodendron uviferum, Laureliopsis philippiana* and *Amomyrtus luma* were being exhausted, the interior and western zones of difficult access of the island remained untouched. In the course of the 18th Century, Indians labouring for the Spaniards began to exploit resources of the adjacent areas. The extraction of *Fitzroya* reached the Bay of Aisén in 1880 and the Baker Channel as late as 1905, although with enormous difficulties due to their isolation.– We may also mention that Charles Darwin (1809–1882) was one of the first to describe in detail Nature and human life on the Island of Chiloé.

In October 1908, Skottsberg's expedition crossed the Andes travelling across the lakes Todos los Santos and Nahuel Huapi. Still on the western side of the Cordillera, Skottsberg remarks that the "forest here still bear a marked resemblance to those on Chiloé" (p. 160). They then had an excursion arranged to the foot of the extinct volcano Tronador. They "climbed across the huge moraines on to the ice-border itself, which is somewhat curious. All the lower part is covered by sand and gravel, and the glacier advances so very slowly that vegetation has time to take possession of it. There are small groves of dwarf trees, some getting not less than twenty or thirty years old be-

fore they are carried down to destruction" (p. 159). This phenomenon can still be studied at present.

White men crossed the Cordillera at this latitude for the first time in the 17th Century. Niccolò Mascardi and other Jesuits explored several passages between 1670 and 1717, which were again used by the Franciscan Francisco Menéndez (1771–1795) in 1792. These passes remained hidden in the impenetrable Valdivian jungle, until they were rediscovered around mid 19th Century. Among the expeditions of that time stand out the observations of Bernardo Philippi, Francisco Fonck, and Guillermo Cox. The so-called Cruce de los Lagos became a route of commerce of increasing importance between the two countries a few years after Skottsberg had travelled it, and it is nowadays a well-known tourist excursion.

Around lake Nahuel Huapi, the Swedes appreciated the change the vegetation undergoes from West to East: "far to the west dark forests... ; in the east [the lake] opens into the endless widths of the pampas, the mountains are left behind; the forests have dissolved into groves and patches" (p. 161). Bariloche, on the edge of the forest region stands on the west under the dominion of *Austrocedrus chilensis;* in the east begins the yellowish steppe.

After having undertaken short excursions into the surroundings of Bariloche, the Swedish expedition set forth on a 2500 km voyage on horseback, across a scarcely populated land, to Punta Arenas. This extremely long distance would be covered successfully in 56 days – and may rightfully be taxed as an unprecedented expedition bearing no equal.

On October 23rd, 1908, the caravan, with only 10 horses, left Bariloche, heading for the South. They passed through Ñorquinco, El Maitén and Leleque, three estancias that had been established not much earlier, at the eastern limit of the forest. In the Valle 16 de Octubre, they examined the fertility of the soil and observed the work of individual colonists, most of them of Welsh origin. They then travelled along the rivers Corintos and Futaleufú to the border with Chile, finding again the arboreal species of the Valdivian forest. On November 15th, they left behind the forests and the river Tecka. The next stages were: Río Pico and the valley of Rio Cisnes, both located in the zone of transition between forest and steppe.

This region had been visited by the Englishman George Musters, who had voluntarily incorporated himself into an indigenous caravan in 1870. In his fascinating book, "At home with the Patagonians; a year's wanderings over untrodden ground from the straits of Magellan to the Río Negro" (1871), he describes how the eastern fringe of the forest is composed of standing dead, whitened trees, without any traces of having suffered the effects of fire.

Although forest fires became very common with the arrival of the white man, it still remains a matter of dispute whether fires had occurred in prior times and whether the zone of transition has displaced itself from West to East, or in the opposite direction. The naturalist Roberto Krautmacher had accompanied the Chilean Boundary Commission to these areas in 1898, where the borderline between Argentina and Chile was settled in 1902.

The expedition continued along the East of the lakes La Plata and Fontana, and from there onwards again to the border zone, which at that latitude coincides roughly with the eastern limit of the forest. At the beginning of December, the expeditionaries headed westwards, following the course of the river Aysén down to the Pacific. Once more, they were able to appreciate the remarkable difference in the vegetation. They spent some days in the area of the confluence of the rivers Aysén and Mañihuales, the latter one being named after the maniú hembra (*Saxegothaea conspicua*). These rivers had been explored by Enrique M. Simpson Baeza (1835-1901) in 1871 and later on by Steffen and the Swedish naturalist Per C.H. Dusén (1855-1926) in 1898.

On December 3rd, Skottsberg's expedition left behind the young settlement of Coyhaique, without any hope of meeting other colonists further to the South. They travelled through the Valley Koslowsky, where today are located the villages of Balmaceda in Chile and Lago Blanco in Argentina, and crossed latitude 46° S arriving at the lake Buenos Aires, the largest of Patagonia. They explored the eastern slopes of this huge water-mirror, finding new plant species, as well as fossilised plants.

Climbing between the rivers Los Antiguos and Jeinimeni, they continued along the Zeballos – at that time a forest area, nowadays deteriorated, due to exploitation of timber and the introduction of animals –, followed a passage at 1500 m above sea level, through a fantastic volcanic area, and finally descended to the lakes Pueyrredón and Posadas.

The southern slopes of these lakes were first described by the palaeontologist John Bell Hatcher (1861–1904), in 1901, who blames the Boundaries Commissions, who were working in those areas at the time, to provoke disastrous forest fires.

After crossing the high tableland of Cerro Belgrano, Skottsberg and his companions came to the basin of the lakes which today belong to the PN Perito Moreno, at 48° S. In those localities, they encountered German colonists, who had just arrived and who gave them a hearty welcome. They also found a canvas boat the Boundary

Commission had left, on which they embarked towards the West. Between Christmas and New Year they reached lakes and mountains, located to the West of the hitherto known world, and they studied the geology of the mighty Cerro Lorenzo whose summit is at 3706 m above sea level.

New Year's Eve (1909) had them again marching towards the next big lake, San Martín. For ten days they surveyed its numerous arms, and came close to a glacier stemming from the Southern Ice Field. Neither the hard conditions nor the precarious boat prevented them from studying the material of the moraines – an investigation that threw new light on the geological constitution of mountains that had never been visited before.

Once more, the expeditionaries had to cross a basaltic tableland to reach the next large lake, Viedma. It drains through the river Leona, and following its course, Skottsberg arrived at Lake Argentino, which on its turn drains towards the Atlantic Ocean through the mighty river Santa Cruz.

> Antonio Viedma discovered the lake that was to carry his name, in 1787. The other big lakes to the south of the Nahuel Huapi were discovered by Argentine explorers – among who stand out Francisco Pascasio Moreno (1852–1919) and Carlos María Moyano (1854–1910) – during the last third of the 19th Century. Darwin and FitzRoy travelled the river Santa Cruz upwards, in 1834, but did not reach Lake Argentino.

From an elevated point to the West of the actual town El Calafate, Skottsberg made several observations. In 1907, Quensel had explored in detail Lake Argentino, while the rest of the Swedish Magellan Expedition was surveying the Falkland Islands. Of particular importance were Quensel's observations on the Perito Moreno glacier which at that time was advancing rapidly, dragging with it the forests of the adjoining slopes. At present, the front of this glacier has surpassed the line it had reached at the beginning of the 20th Century, behaving in a way that seems to contradict the widespread tendency of glaciers to recede.

Quensel had also attained a water-division on the bifid glacier Frías-Dickson, on an unknown sector of the Southern Ice Field – being an area that was to create dissent about the border-line until its definite delimitation in 1998.

In this region, the Swedish expedition is remembered above all for baptizing a gigantic glacier Uppsala Glacier, located on the farthest north-western area of the lake, on a place Quensel had reached rowing, and where he found himself in peril of life, due to a sudden change of the water level because the glacier had discharged a barrier of ice (p. 277).

The expedition headed for the South, crossing to Chile on a passage not open nowadays. In February 1909, we find Skottsberg in the area of the actual PN Torres del Paine, exploring a sector to the West of Lago de Grey. He reached the border of the glacier near Cerro Zapata, after advancing tediously through thickets of *Maytenus magellanica,* "so dense that we hardly saw the horses, which we dragged along by the *cabresta*" (p. 286). That western point had never been reached before, and it is today the goal of a demanding excursion that only few undertake.

Quensel had been more to the East in 1907, travelling along the southern face of the Paine Grande and the Cuernos del Paine, geologically the most interesting sector of the Parque Nacional. Unfortunately, the trusting huemuls Quensel had observed there, and in other places, have disappeared.

On the last stretch to Punta Arenas, the Swedes visited the "Mylodon cave", famous for the well-conserved remains of a *Glossotherium,* an extinct animal, found there a decade earlier. The presumed existence of living individuals nourished tales and encouraged voyages, and served as thread for Bruce Chatwin's (1094–1989) classical "In Patagonia" (1977).

The journey, in the course of which, Skottsberg and his companions traversed on horseback 12° of latitude in two months, ended in Punta Arenas on February 21st, 1909.

However, the Swedes embarked again to travel through the Beagle Channel and visit the Island of South Georgia, before returning to Sweden in June 1909.

20. Glossary of technical terms*

Numbers (e.g. **8.1**) point to chapters and paragraphs; „**Fig…**" indicate the illustration in question.

achene Dry, indehiscent fruit, usually issued from an inferior ovary. It contains one seed, and the pericarp is not fused to the seed (Fig. 9.11j).

acorn Dry, hard, indehiscent, achene-like fruit, with a single, large seed and a cup-like base (e.g. *Quercus*) (Fig. 9.11i).

alternate Regarding leaves: Borne singly at each node (Fig. 9.2a). In flowers: Borne between rather than over other organs (e.g. petals between sepals).

ament Catlike inflorescence, consisting of a dense spike or raceme of usually unisexual, often apetalous flowers (Fig. 9.10j).

androecium The set of stamens of a flower.

anemophilous Wind pollinated.

angiosperms See 7. and 9.

appressed An organ pressed flat or close to another (Fig. 8.1f; 8.2e).

aril Fleshy thickening of the seed coat which partially covers the seed, as in *Taxus*.

berry Fruit with a soft pericarp and fleshy meso- and endocarp, usually bearing several seeds (Fig. 9.11d).

blade Leaf blade. The broad, expanded part of a leaf (Fig. 9.1a).

bract-scale In conifers, a reduced leaf in female cones, immediately below the seed scale and usually fused to it (8.3; Fig. 8.5–8.7).

branch Secondary axis, issued from the main stem; also: a major division of the trunk.

calcifuge Preferring soils low in limestone.

calyx The set of sepals of a flower. Outer whorl of the perianth in flowers that have two whorls of different organs covering stamens and carpels in the flower bud.

cambium A tissue of cells in stems and roots of woody plants capable of dividing actively, thus giving rise to the secondary growth. Monocots lack a classical cambium (10).

capitulum An inflorescence – a head (dense, rounded cluster) of flowers (Fig. 9.10f).

capsule A dry, dehiscent fruit that develops from two or more united carpels (Fig. 9.11b,c).

carpel Each one of the modified leaves forming the gynoecium of the angiosperms. Each carpel encloses one or more ovules.

caryopsis A dry, indehiscent, one-seeded fruit, with the pericarp firmly united all around the seed coat (Fig. 9.11g).

catkin See ament.

cirriferous An organ ending in a tendril.

connate Organs fused or united in an early stage of their development.

coriaceous Of a leathery texture.

corniculate Having a small, horn-like protuberance.

* After Harris and Harris (2001), Purves et al. (2001), Raven et al. (2001), Swart (1971), Thain and Hickman (2001), usually modified.

corolla The set of petals of a flower.

corymb An umbrella-like racemose inflorescence, with the lower pedicels longer than the upper (Fig. 9.10i).

cupula A cup-shaped protuberance, partly enveloping another organ.

cuspidate Ending abruptly in a rigid point, *not* gradually i.e. acuminate (Fig. 9.4f).

cyme A flat- or round-topped, paniculate inflorescence, with the terminal flower usually blooming first (Fig. 9.10h).

decurrent An organ extending itself backwards on the axis from the point of its insertion.

decussate Opposite. Said of leaves arranged in pairs, one in front of the other; successive pairs at right angles to each other (Fig. 8.2c; 9.2c).

dehiscence The opening of an anther, fruit, or other structure, which allows the escape of reproductive bodies contained within.

dichasium A flat-topped or rounded inflorescence, in which each axis ends in a flower and produces two opposite, subordinate axes. (= A cyme with two axes running in opposite directions.) (Fig. 9.10g).

dicots See 10.

dimorphic Said of organs appearing in two different forms.

dioecious A species with unisexual flowers, each individual bearing either male or female flowers.

distichous Said of organs arranged in two lines or rows.

drupe An indehiscent fruit, characteristically with a soft, thin exocarp, a fleshy mesocarp, and a hard endocarp, containing a single seed (Fig. 9.11e).

egg cell The oosphere, i.e. the female gamete, borne on the ovule.

emarginate Said of a leaf blade with a slightly notched apex (Fig. 9.4b).

endocarp Innermost tissue of the pericarp (fruit coat).

even-pinnate Said of a pinnately compound leaf having a terminal pair of leaflets, sometimes having an apical tendril (instead of an apical leaflet) (Fig. 9.7a).

evergreen Said of plants with leaves (or other green organs) that persist on them for more than two years. Having green leaves at all seasons.

exocarp Outer tissue of the pericarp (fruit coat).

falcate Scythe-like (sickle-shaped) (Fig. 9.3a).

fascicle A cluster of leaves or flowers, inserted at one point (e.g. leaves on a short shoot of *Cedrus*).

female cone In conifers, the female inflorescence (8.3).

fertilisation The union of a female and a male gamete.

flabellate Fan-shaped (Fig. 8.1e).

flower Typically, the reproductive organ of an angiosperm, consisting of an axis bearing four whorls of specialised, modified leaves: sepals, petals and, as fundamental parts, stamens and carpels (9.2; Fig. 9.8a). In gymnosperms, the male cones are equivalent to unisexual flowers (8.3).

follicle A dry, dehiscent fruit, composed of one carpel and opening along a single side.

fruit In a broad sense: A flower with ripe seeds. In a narrow sense: A fertilised ovary containing ripe seeds.

fusiform Said of a spindle-shaped organ, being broadest in the middle and tapering towards its ends.

glabrous hairless, smooth.

glaucous Covered with a bluish or whitish waxy bloom.

globose Spherical, globe-like.

gymnosperms See 8.

gynoecium The set of carpels of an angiosperm flower.

hapaxanthic A plant that flowers only once, and then dies.

haustorium A root-like structure of parasites which serves as an attachment to draw nourishment from host plants.

heartwood The innermost, usually darker wood of the tree trunk.

hemiparasite A partially parasitic plant which is still capable of photosynthetic activity.

hip A fruit composed of a hollow, fleshy receptacle containing several achenes (Fig. 9.11m).

hirsute With stiff, coarse hairs.

husk The tough outer covering of some fruits and seeds.

hygrophilous Said of a plant naturally growing where moisture is abundant.

hypanthium The receptacle or floral axis, when it grows cup-like, bearing the ovaries on its inner surface, but sepals, petals, and stamens on its edge (Fig. 9.9b).

imbricate Overlapping, like the shingles of a roof.

Imparipinnate Odd-pinnate.

indehiscent Not opening when ripe (e.g. a nut).

inferior ovary An ovary borne in the cavity of an hypanthium, thus appearing beneath the other floral organs (Fig. 9.9b).

inflorescence A cluster of flowers; the arrangement of flowers on the flowering axial system of a plant.

keel A prominent ridge on an organ.

keeled An organ having a keel-like shape.

lanceolate Much longer than broad, widest below the middle and tapering to a pointed apex (Fig. 9.3e).

leaf blade The broad part of a leaf (Fig. 9.1a).

leaflet One of the component parts of a compound leaf (Fig. 9.1b).

legume A dehiscent fruit formed from a single carpel, opening at the ventral suture and the dorsal vein (Fig. 9.11a).

lobe A rounded division of a plant organ (Fig. 9.6c–e).

locucidal Said of dehiscent fruits (capsules) that split down the midvein (central vein) rather than down the ventral suture (Fig. 9.11b).

locule A compartment of an organ, e.g. an ovary, containing seeds or pollen or spores.

long shoot In plants with two kinds of twigs, those with, in principle, unlimited, normal, length growth which bear dwarf, short shoots.

male cone In conifers, the short shoot with microsporophylls (Fig. 8.3; 8.4).

mature cones In conifers, female cones with mature seeds.

megasporophyll In conifers, the seed scale or ovuliferous scale (Fig. 8.5).

mesocarp The middle layer, between exocarp and endocarp, of the pericarp (fruit coat).

microsporophyll In conifers, the organ carrying the microsporangia in which pollen is formed (Fig. 8.4).

monocots See 10.

monoecious Said of plants with unisexual flowers borne on the same individual.

mucro A sharp terminal point or tip.

nucellus The central part of an ovule within which the embryo sac with the egg cell develops.

nut A dry, indehiscent fruit, containing usually a single seed (Fig. 9.11f).

nutlet A small nut.

odd-pinnate Said of a pinnately compound leaf having a terminal leaflet (Fig. 9.7b).

operculum A small lid that first closes certain organs, but eventually falls off.

opposite Said of organs (e.g. leaves) borne across from one another at the same node.

ovary In a single carpel, the basal, swollen part which bears the ovules. In a flower with two or more united carpels, the compound organ formed by the union of the ovaries.

ovoid Said of egg-shaped, three-dimensional objects.

ovule In conifers, the organs which develop on the seed scale. (Fig. 8.5; 8.6). In angiosperms, the organs developing within the ovary (Fig. 9.8a; 9.8b). The ovules bear the egg cell. After fertilisation, the ovule transforms itself into the seed.

ovuliferous scale seed scale

palmately-lobed Palmatifid.

palmatifid Said of a palmately veined, lobed leaf, with divisions that do not reach deeper than the midway between the margin and the centre of the leaf blade (Fig. 9.3n).

palmatisect Said of a palmately divided leaf (Fig. 9.3o).

panicle A racemosely branched inflorescence, the branches of which are on its turn racemosely branched, that usually flowers from the bottom upwards (Fig. 9.10b).

paripinnate Even-pinnate.

pedicel The stalk of a single flower in an inflorescence.

peduncle The stalk of a solitary flower or of an inflorescence.

peltate Shield-shaped. Said of rounded leaves, with the petiole inserted on the centre of the leaf blade.

perennial Evergreen.

perianth Outer part of an angiosperm flower, enclosing stamens and carpels; in dicots, usually comprising two whorls of differently shaped organs – the green calyx and the conspicuous and often brightly coloured corolla.

petaloide Petal-like.

petiole Stalk of a leaf.

phyllodium An expanded, leaf-like petiole, replacing the lacking true leaf blade (see *Acacia melanoxylon*).

pluriovulate Said of an ovary bearing several ovules.

pod Legume.

pollination The transfer of pollen from an anther to a stigma.

polygamous Said of a plant having hermaphrodite, male, and female flowers.

polygamous-doecious Said of a dioecious plant which has a few hermaphrodite flowers.

polygamous-monoecious Said of a monoecious plant which has a few hermaphrodite flowers.

pome A compound fruit with a fleshy receptacle, issued from an inferior ovary (Fig. 9.11n).

precocious Said of a plant the flowers of which develop before the leaves.

pubescent Covered with short, soft hairs.

pulvinus A swelling at the base of a leaf stalk or on a twig (see *Picea*).

raceme An inflorecence, composed of pedicelled flowers arranged along the (main) axis, i.e. an axis bearing single flowers at its nodes; it usually flowers from the bottom upwards (Fig. 9.10a).

rachis Said of the main axis in a compound leaf.

receptacle The portion of the pedicel or peduncle of a flower which bears the floral organs.

reflexed Said of organs that are bent backwards or downwards.

revolute Said of leaf margins which are bent towards the underside.

rostrate Said of an organ with a short, terminal beak.

rugose Wrinkled.

samara An indehiscent, winged, achene-like fruit (Fig. 9.11h).

scarious Said of a dry, thin, membranous organ.

seed-scale In female cones of conifers, the scales carrying the ovules (Fig. 8.5).

septicidal Said of dehiscent fruits (capsules) that split down the ventral sutures and along walls (septa) uniting the carpels (Fig. 9.11c).

short shoot A twig with very short internodes and limited length growth (Fig. 8.2f).

spike An inflorescence, consisting of a main axis bearing sessile or sub-sessile flowers; usually flowering from the bottom upwards (Fig. 9.10.e).

spur shoot Short shoot, bearing leaves or flowers (fruits).

stamen Each of the organs that produce pollen, the set of which is the androecium (Fig. 9.8a).

staminode A modified, sterile stamen.

standard The upper, usually largest petal of a pea-like flower (family: Fabaceae).

stigma Apical, usually papillose portion of a carpel.

stipule Said of leaf-like appendages, found at the base of the stalk of some leaves.

stomatic band Usually whitish bands, frequently found on the underside of the leaves of conifers.

style Usually elongated, narrow part of a carpel between ovary and stigma (Fig.9.8a).

superior ovary An ovary borne above the other floral organs, on the top of a cone-shaped or disc-like receptacle (Fig.9.9a).

syncarp A multiple fruit, usually a cluster of fleshy fruits originating from separate flowers, e.g. in *Morus*.

tendril Said of a part of a leaf modified into a slender, coiling structure.

tepal Said of organs belonging to the perianth, when there is no clear difference between sepals and petals.

tomentose Said of an organ covered with short, soft, matted, woolly hairs.

twig A small shoot or branch of a shrub or a tree.

umbel A convex or flat-topped inflorescence, consisting of an axis and the pedicels of the flowers arising from one common node (Fig.9.10c).

umbo A protuberance at the tip of the scales of certain female cones of pines.

undulate Said of the wavy margin of a leaf.

unicarpellous Said of a gynoecium consisting of a single carpel.

unilocular Said of an ovary formed by the union of two or more carpels, but having one single compartment.

valvate Said above all of capsules that open by valves (Fig.9.11b–c).

vein A vascular bundle („nerve"), as it appears in leaves and other leaf-like organs.

velutinous Covered with short, soft, spreading hairs.

verticillate Whorled.

21. Abbreviations

21.1. Argentine Provinces

BA	Buenos Aires
CA	Catamarca
CH	Chaco
CHU	Chubut
CO	Córdoba
COR	Corrientes
ER	Entre Ríos
FO	Formosa
JU	Jujuy
LP	La Pampa
LR	La Rioja
ME	Mendoza
MI	Misiones
NE	Neuquén
RN	Río Negro
SA	Salta
SC	Santa Cruz
SE	Santiago del Estero
SF	Santa Fe
SJ	San Juan
SL	San Luis
TF	Tierra del Fuego
TU	Tucumán

21.2. Medicinal system*

TM	Traditional medicine
TCM	Traditional Chinese medicine
TEM	Traditional European medicine
TAM	Traditional African medicine
TIM	Traditional Indian medicine (including Ayurveda)
TNAM	Traditional North American medicine
TSAM	Traditional Central & South Amercan medicine
TAUM	Traditional Australian medicine
MM	Modern medicine

21.3. Other abbreviations

CITES	Convention on International Trade in Endangered Species
GISD	Global Invasive Species Database

* According to van Wyk & Wink (2004).

22. Literature

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23. English Plant Names

24. Nombres comunes

25. Scientific Plant Names*

* Numbers in brackets (...) refer to the genus